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FM 31-10

DEPARTMENT OF THE ARMY FIELD MANUAL

DENIAL OPERATIONS AND BARRIERS

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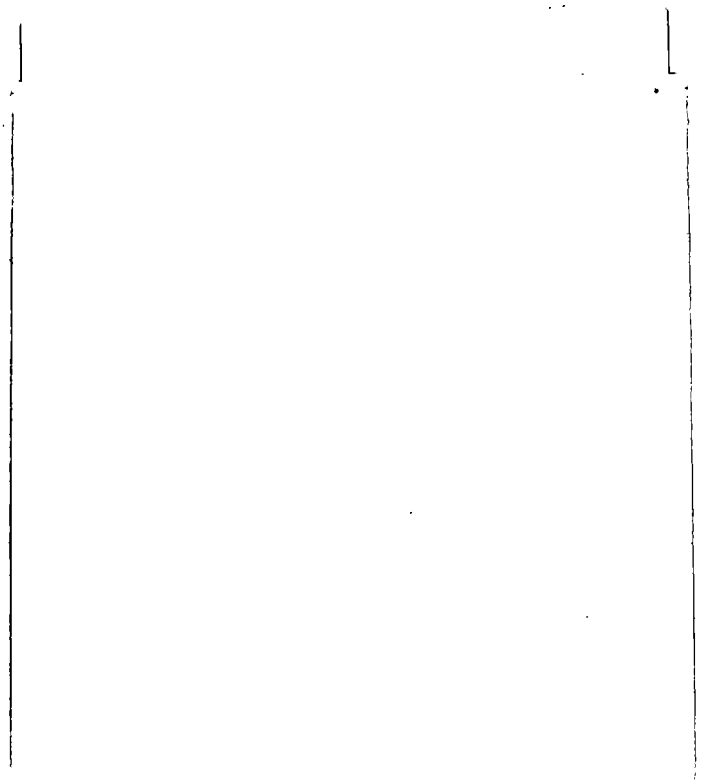

FIELD MANUAL
No. 31–10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *16 September 1968*

DENIAL OPERATIONS AND BARRIERS

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*This manual supersedes FM 31–10, 14 August 1962 including C 1, 4 June 1965.

CHAPTER 1

INTRODUCTION

1-1. Purpose and Scope

a. This manual provides guidance to commanders and staff officers in the conduct of denial operations and the employment of barriers in a theater of operations. It sets forth responsibilities, principles of employment, and procedures for planning and coordinating the conduct of denial operations and the employment of barriers at various command echelons. This manual does not include, in its discussion of barriers, guidance and doctrine on the emplacement of individual obstacles for local security.

b. This manual discusses organizational and operational aspects of denial operations and the use of barriers in general terms only. Appendix A lists references that contain detailed discussions of procedures, techniques, and organizations. This manual repeats details and techniques described in other manuals only as required for clarity or consistency.

c. The contents of this manual are applicable to—

(1) General war, to include consideration of the employment of and protection from nuclear, biological, and chemical (NBC) munitions; and operations in NBC environments.

(2) Limited war.

(3) Cold war to include stability operations.

1-2. Recommended Changes

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of text in which the change is recommended. Reasons will be provided for each comment to insure thorough understanding and complete evaluation. Comments should be forwarded direct to the Commanding General, U.S. Army Combat Developments Command, Institute of Combined Arms and Support, Fort Leavenworth, Kansas 66027. Originators of proposed changes that would constitute a significant modification of approved Army doctrine may send an information copy, through command channels, to the Commanding General, U.S. Army Combat Developments Command, Fort Belvoir, Virginia 22060, to facilitate review and follow-up.

1-3. Relationship between Denial Operations and the Employment of Barriers

a. Definitions.

(1) *Denial operation:* an operation designed to prevent or hinder enemy occupation of or benefit from areas or objects having tactical or strategic value.

(2) *Barrier:* a coordinated series of obstacles designed or employed to canalize, direct, restrict, delay, or stop the movement of an opposing force and to impose additional losses of personnel, time, and equipment on the opposing force.

b. Relationships.

(1) The theater commander's plan for denial operations assigns specific missions to each theater component force. These missions may include such measures as naval blockade of port facilities, aerial interdiction of lines of communication, the development of barriers, and psychological operations. They may also include the erection of obstructions and the destruction, removal, or contamination as appropriate of areas or objects of potential significance to the enemy. Denial operations are basically strategic in concept; however, denial targets are normally identified as part of the tactical barrier plan.

(2) A barrier normally links natural and artificial obstacles in a linear form. In the ini-

tial stages of development, a barrier is not an impenetrable line of great depth and continuous strength. As a minimum, one major obstacle should be presented to an enemy attempting to pass through the barrier system at any given point. A barrier may be used as a denial measure in border control and other operations.

c. Both denial operations and barriers reduce the combat power exerted against friendly forces. Barriers hinder the movement of enemy maneuver elements, while denial operations are aimed at impeding their overall ability to move and to conduct operations. The successful employment of barriers and the execution of denial operations depend on sound planning, the exploitation of natural terrain obstacles, and the effective use of available resources. Denial operations and the use of barriers must be closely coordinated with tactical plans.

1-4. Governing Consideration

The following considerations govern the conduct of denial operations and the use of barriers:

a. The trend toward mechanization in present-day armies and the increased speed and tempo of modern combat operations make essential the thorough planning and effective conduct of denial operations and the erection of barriers. Denial operations and the employment of barriers are among the more important means available to the commander to reduce the tactical mobility of the enemy.

b. Denial operations are strategic in concept and vary widely in scope. At one extreme is a scorched earth policy, in which an entire region is made useless to the enemy. At the other extreme is a small-scale operation, in which the use of a specific area or facility is temporarily denied to the enemy. The scope of most denial operations normally lies somewhere between the two extremes. Through the selective removal, contamination, or destruction of equipment or areas, denial operations can materially impair the enemy's ability to conduct operations and wage war. In themselves, such operations cannot destroy his will and ability to fight; however, they can create conditions that make the enemy's operations more difficult, thus supporting friendly plans and operations. In denial operations, commanders must insure that damage to resources that do not directly enhance the enemy's military effort is kept to the minimum. Indiscriminate destruction that affects military targets only slightly but that has a disastrous effect on civilian facilities may—

(1) Impede the operations of friendly clandestine or guerrilla forces in the area.

(2) Create resentment and hostility against friendly forces on return of civilians to the area.

(3) Require excessive rehabilitation effort after reoccupation of the area.

(4) Delay or prevent the realization of posthostilities or long-range plans for the area.

c. Plans of corps, field army, or army group are the basis for the barriers or barrier systems established.

d. In the forward portion of the combat zone, tactical mobility is essential to successful combat operations. Occupation of terrain by a unit may be limited to a few hours and will seldom exceed a few days unless the unit is engaged in extended defensive operations. Extensive artificial obstacles cannot be emplaced and removed in sufficient time to achieve the desired degree of tactical mobility; therefore, they are seldom employed except when they are emplaced prior to hostilities or when preparing for a planned retrograde operation. Units rely on artificial obstacles which reinforce and strengthen natural obstacles and which can be constructed and cleared quickly. Mines are particularly useful in the forward combat area because they are portable, easily emplaced and removed, and relatively small in size in relation to their effects. Supporting fires can also reduce the mobility of enemy forces and increase the mobility of friendly forces. Mines (to include aerially delivered systems) are habitually used to block access routes, avenues of approach, and defiles. In the forward portion of the combat zone, mines are usually installed and removed by hand; mechanical minelaying equipment generally is not used.

e. In the rear portion of the combat zone or

prior to an anticipated enemy attack, extensive barriers can be constructed, including the large-scale use of barrier minefields, wire obstacles, antitank ditches, and other artificial obstacles. Extensive barriers assist in limiting deep enemy penetrations or wide envelopments. The width and depth of these barriers depend on their purpose, the tactical situation, the natural terrain obstacles, and the available time, labor, materials, transportation, equipment, and other combat service support. Minefields in the rear portion of the combat zone are laid by mechanical minelayers, when possible, and are emplaced to gain maximum surprise and deception.

CHAPTER 2

PLANNING FOR DENIAL OPERATIONS AND THE USE OF BARRIERS

Section I. AUTHORITY

2-1. Authority for Denial Operations

a. Authority. The theater commander, subject to national policies and limitations, is authorized to conduct denial operations as a part of his overall campaign. He establishes the policies governing denial operations in the theater and delegates planning and execution to the Service component commanders (Army, Navy, and Air Force) and to subordinate joint force commanders.

b. Control. Because of the long-range economic, political, and psychological effects, and the immediate military disadvantages of excessive destruction, major strategic denial operations are tightly controlled by the higher echelons of command. It is particularly important to insure that strategic and tactical air strikes do not destroy those facilities that may be required to support friendly military operations or posthostilities plans. The close relationship between major strategic denial operations and the interdiction activities of strategic and tactical air (Air Force, Navy, Marine, and allied), long-range missiles, and naval operations makes it essential that the control of denial operations be vested in the commander with overall operational command in the area of operations—the theater commander.

2-2. Authority for the Employment of Barriers

Al commanders use natural and artificial obstacles to improve security, strengthen close-in defenses, and assist in the organization of the position. Corps is the lowest command level that is authorized to order the employment of barriers. Corps may delegate this authority to division and comparable commanders. The commander of the theater army support command (TASCOM) may order the employment of barrier systems to counter airborne, amphibious, guerrilla, or other tactical threats. He may delegate this authority to the area support command (ASCOM) commander.

Section II. RESPONSIBILITIES

2-3. Command Responsibility

a. Denial Operations. The theater commander establishes policies governing denial operations. He does not normally delegate this authority. Subordinate commanders carry out denial operations as directed by the theater commander and implement the theater commander's policies for employing barriers.

b. Employment of Barriers. Corps and higher commanders are responsible for the employment of barriers. They can delegate this authority to division commanders. Commanders responsible for employing barriers plan for and make maximum practicable use of barriers unless restricted by a higher headquarters. Barrier traces prescribed in the barrier plans of major commands represent a general line joining the major natural obstacles astride avenues of approach that the commander determines must be blocked to support his planned operation. Barrier traces are essentially coordinating devices for subordinate commands to locate and determine the specific obstacles. The various command echelons can accomplish barrier planning concurrently or successively (usually the latter). Barrier plans do not necessarily include all barriers and obstacles needed by subordinate units.

2–4. Staff Responsibility

a. Division and Higher Staffs.

(1) The assistant chief of staff, G3, has the primary staff responsibility for planning denial operations and the use of barriers at division and higher levels. Specific responsibilities of the G3 include—

(*a*) Supervising and coordinating the development of all denial and barrier studies and plans.

(*b*) Recommending priorities for allocation of personnel, supplies, and equipment in support of denial operations and the use of barriers.

(*c*) Recommending allocation of barrier and denial munitions and mines filled with toxic chemical agents and nuclear or atomic demolition munition (ADM) weapons for target destruction and radiological contamination purposes.

(*d*) Recommending the assignment of tasks to subordinate units, including the assignment of responsibility for specific denial targets to specially formed denial teams.

(*e*) Integrating denial operations and the use of barriers into the overall tactical plan, including fire support plans.

(*f*) Recommending limitations and restrictions on minefields, boobytraps, chemical munitions and mines, and ADM's and the extent of destruction of denial targets.

(*g*) Recommending the location of gaps and lanes in the barrier.

(*h*) Establishing the construction timetable, priority of construction, and the obstacle and denial target reporting and execution instructions.

(*i*) Recommending the general location of barriers (covering, forward, flank, intermediate, and rear) and the extent to which denial operations and barriers will be used to achieve tactical or strategic objectives.

(2) The assistant chief of staff, G1, has staff responsibility for the procurement and allocation of civilian labor, the development and administration of civilian labor policies, and the execution of all other personnel matters pertaining to the use of civilian labor in denial operations and the construction of barriers. In discharging his responsibility, the G1 coordinates with the G5 (see (5) below, and FM 101–5).

(3) The assistant chief of staff, G2, has staff responsibility for the intelligence aspects of denial operations and barriers. Specific responsibilities of the G2 include—

(*a*) Providing information concerning enemy capabilities, order of battle, location, and situation.

(*b*) Providing detailed information on potential denial targets.

(*c*) Developing the counterintelligence portion of barrier and denial plans.

(*d*) Supervising the collection and development of reconnaissance information, air photographs, terrain studies, and analyses of the areas of operations and similar information that is needed in planning.

(4) The assistant chief of staff, G4, is responsible for coordinating the logistic support required for denial operations and barriers. This support demands careful and detailed planning and close staff coordination since it is frequently a determining factor in the number and types of obstacles and denial targets established. Other specific responsibilities of the G4 include—

(*a*) Forecasting requirements for materials, transportation, and equipment based on denial and barrier studies and plans, and insuring that necessary items are requisitioned, shipped forward, and stocked in depots and supply points to be available when required.

(*b*) Reviewing the impact of denial and barrier studies and plans on logistic operations and informing the G3 of inconsistencies between plans and capabilities that cannot be resolved.

(*c*) Allocating denial and barrier materials, transportation, and equipment in accordance with priorities established by G3.

(5) The assistant chief of staff, G5 (civil affairs), coordinates with the local civil authorities to insure that the local civil populace does not interfere with denial operations and the use of barriers. The G5 also insures that denial operations and barrier development are carried out so as to have the least adverse impact on the daily activities of the civil popula-

tion, consistent with the tactical mission. He determines the availability of local labor in accordance with theater policy and coordinates with the local civil authorities in procuring local labor based on requirements established by G1.

(6) The engineer officer is the special staff officer with the principal interest in barrier planning. His specific responsibilities include—

(*a*) Planning and supervising all engineer activities pertaining to barriers.

(*b*) Assisting the G2 by developing terrain studies and reconnaissance information for the analysis of the area of operations and the evaluation of certain denial targets.

(*c*) Preparing portions of the barrier (and denial) plan under the supervision of the G3.

(*d*) Assisting the G4 in developing a denial and barrier logistic estimate.

(*e*) Coordinating the efforts of civilian and indigenous labor engaged in barrier work.

(*f*) Supervising the technical aspects of engineer troop employment in denial operations and barrier emplacement, and recommending to the G3 the allocation of engineer resources and the assignment of engineer units to emplace obstacles and execute denial targets requiring special engineer skills and equipment.

(*g*) Locating and determining the effectiveness of, individual obstacles and denial targets from actual reconnaissance or study of maps and air photographs.

b. Brigade and Lower Staffs.

(1) In brigade, regiment, group, and battalion staffs, the S3 has primary staff responsibility for the tactical employment of obstacles and the destruction or neutralization of denial targets assigned to the unit. Other staff officers provide the S3 with input and planning guidance.

(2) The S2 uses terrain studies and reconnaissance information to evaluate the terrain in relation to the tactical plan. The S2 also uses information provided by the engineer to determine the value of the natural terrain obstacles.

(3) The S4 coordinates the transportation of barrier materials, allocates barrier materials based on the S3's recommendations, and advises higher headquarters on future requirements.

(4) The attached or supporting engineer unit commander conducts reconnaissance of the area and prepares estimates on time, labor, and materials required to augment natural obstacles. The engineer unit commander provides technical advice, furnishes special equipment, and prepares obstacles as required by the commander of the supported unit. He also assists supported unit commanders in selecting artificial obstacles and reinforcing natural obstacles.

(5) The S3 coordinates with the fire support coordinator on the barrier plan and the use of atomic demolition munitions.

Section III. PLANNING SEQUENCE

2-5. Department of the Army

Department of the Army prepares broad denial and barrier studies of large geographical areas. These studies develop general denial targets and barrier systems, as well as broad planning factors for forecasting materiel, logistics and manpower requirements. The studies may recommend tactical concepts for specific areas. They test the feasibility of a proposed system considering tactical forces and materials likely to be available. The studies also measure the impact of the system on logistic planning and industry.

2-6. Theater of Operations

a. Denial Planning.

(1) Denial planning in the theater of operations begins with a strategic vulnerability study. On the basis of the enemy's strategic shortages disclosed by the study and the military and the industrial resources of the area, the feasibility and scope of denial operations

can be determined, policies formulated, and general plans made. (Detailed plans are based on precise technical information secured through on-site reconnaissance by competent technicians.)

(2) The theater commander's denial policies provide information on specific targets and types of items to be denied, the degree of denial desired, the priority of preparation and execution, and the subordinate commander who is responsible for planning and execution. (Normally, the Army component commander and joint force commanders have the primary responsibility for planning and executing denial operations.) The theater denial plan should be divided in two parts: one part designates significant *tactical* targets or types of targets; the other lists significant *strategic* targets or types of targets.

(*a*) A significant tactical target has an impact on strategic as well as tactical operations. Such a target might be a large railroad bridge that is included in the theater denial plan to deny the enemy the use of the railway system. Since the same bridge offers the enemy a means of breaching a major natural obstacle, it is also included in a barrier plan.

(*b*) A significant strategic target has only a strategic impact. It has no immediate impact on tactical operations. Such a target might be a hydroelectric powerplant. Destruction of the plant will have no significant impact on local tactical operations.

(3) Subordinate commanders implement the theater commander's denial policy. Subordinate units execute assigned denial operations in accordance with, and as a part of, the theater commander's overall denial plan.

b. Barrier Planning. Theater barrier studies are as broad in scope and geographic area as those of the Department of the Army. They may be based on a general reconnaissance of the area, terrain studies, maps, and air photographs. These studies indicate general barrier systems and broad concepts of operations to assist the theater commander in securing the required materials and equipment and in providing the necessary facilities for receipt, storage, allocation, and distribution.

2-7. Theater Army and Army Group

a. Command functions.

(1) Theater army is a major subordinate component command of the unified theater command. The theater army commander is responsible for the broad plans and policies for all army operations assigned to him within the unified command. The theater army commander normally exercises full command of assigned forces during peacetime but passes operational command of selected forces to the unified (theater) commander in wartime. If in the operational chain of command and if assigned an operational mission, the theater army commander carries out the army tasks in the denial and barrier plans of the unified command.

(2) The army group, when established, is in the operational chain of command. Army group is a tactical command and consists of several field armies under a designated commander. Based on plans and instructions from either theater or from theater army (when theater army is in the operational chain of command) the army group commander develops more definitive denial and barrier plans which are issued as separate annexes to letter of instructions (LOI) to the field armies.

b. Denial Planning. Below theater level, instructions for denial operations are normally issued as an annex to a LOI. Based on the type and significance of the denial targets, the theater army and army group commanders determine those targets that will be destroyed under their direct control and those that will be destroyed by subordinate commands. Usually, they assign destruction of all significant tactical targets to subordinate commanders who have barrier responsibilities. Significant strategic targets may be assigned to subordinate commands based on their capabilities and primary interest. If strategic targets are assigned to subordinate commands, specially trained teams may be furnished to assist in the technical aspects of the denial. Such teams may operate directly under the control of the theater army commander, or they may be attached to the army group or field army.

c. Denial Instructions. Appendix C contains

the format and examples of a denial (plan) annex to a letter of instructions. The content of a denial (plan) annex varies with the mission, the issuing command, and the overall situation. In general, the denial (plan) annex includes—

(1) Applicable portions of denial plans and policies of higher headquarters.

(2) Assignment of tasks for planning and execution to subordinate units, including priorities, timing, details of coordination, assistance to be furnished for protecting targets from enemy interference, technicians or specialists to be made available, and reports required.

(3) Policies on the employment of local civilians.

(4) Safety and security measures.

(5) Policies for the evacuation of the local population and important individuals.

(6) Limitations on the means of denial to be used, the amount of destruction permitted or required, and the use of contaminants and nuclear devices.

(7) Allocation of combat service support.

(8) Policies on the use of local resources.

(9) Coordination required with Air Force, Navy, joint force commands, and allied forces.

d. Barrier Planning. Barrier studies are normally conducted as a part of long-range planning at theater army when it has an operational mission, and army group when appropriate. These studies are more detailed, tend to shape specific tactical concepts for the area of operations, and provide a framework for the barrier plans made by the field army. Theater army and army group barrier studies are directly influenced by the disposition, strength, and capabilities of enemy forces in the area. These studies outline the nature and scope of the barrier system, assign areas of responsibility, and allocate resources.

2–8. Field Army

a. General. At field army the strategic denial plan of higher headquarters is combined with the barrier plan into a single, comprehensive, coordinated plan for the conduct of denial operations and the employment of barriers within the field army area (fig. 2–1). The plans are consolidated because most denial targets are executed by construction, destruction, or contamination—all of which, technically, are similar or identical to the work of preparing barriers. Normally, a separate denial annex is not published. Barrier planning is a major function of the field army. Field army formulates general traces of individual barriers within the barrier system as well as barrier policies, instructions, and directives, usually based on barrier studies and directives of army group and higher headquarters.

b. Barrier (and Denial) Plan. Initially, the field army barrier (and denial) plan is not a detailed plan showing all of the individual obstacles or barriers in the field army sector. It is a framework for the barrier plans of subordinate commands. The field army (corps, division) plan usually includes—

(1) Applicable portions of the barrier studies, instructions, or plans of higher headquarters, including pertinent portions of denial plans.

(2) Designation of any specific barriers vital to the command as a whole, with detailed instructions relating to their construction and execution.

(3) The general location of the barriers to be constructed. This insures continuity of the barriers and their establishment in depth. Barrier lines are designated either by a general trace or a series of coordinating points. Subordinate commanders will determine the exact locations of specific obstacles after detailed ground and air reconnaissance and consideration of specific tactical dispositions and plans.

(4) The assignment of areas of responsibility.

(5) When important to the command as a whole, the location and type of specific obstacles, including minefields of major tactical importance. (Specified obstacles usually are indicated by appropriate symbols on the barrier location overlay or are listed in the mission subparagraphs of the barrier annex. Normally, the division determines specific types of obstacles. By specifying a minimum of obstacles by type, the larger unit command-

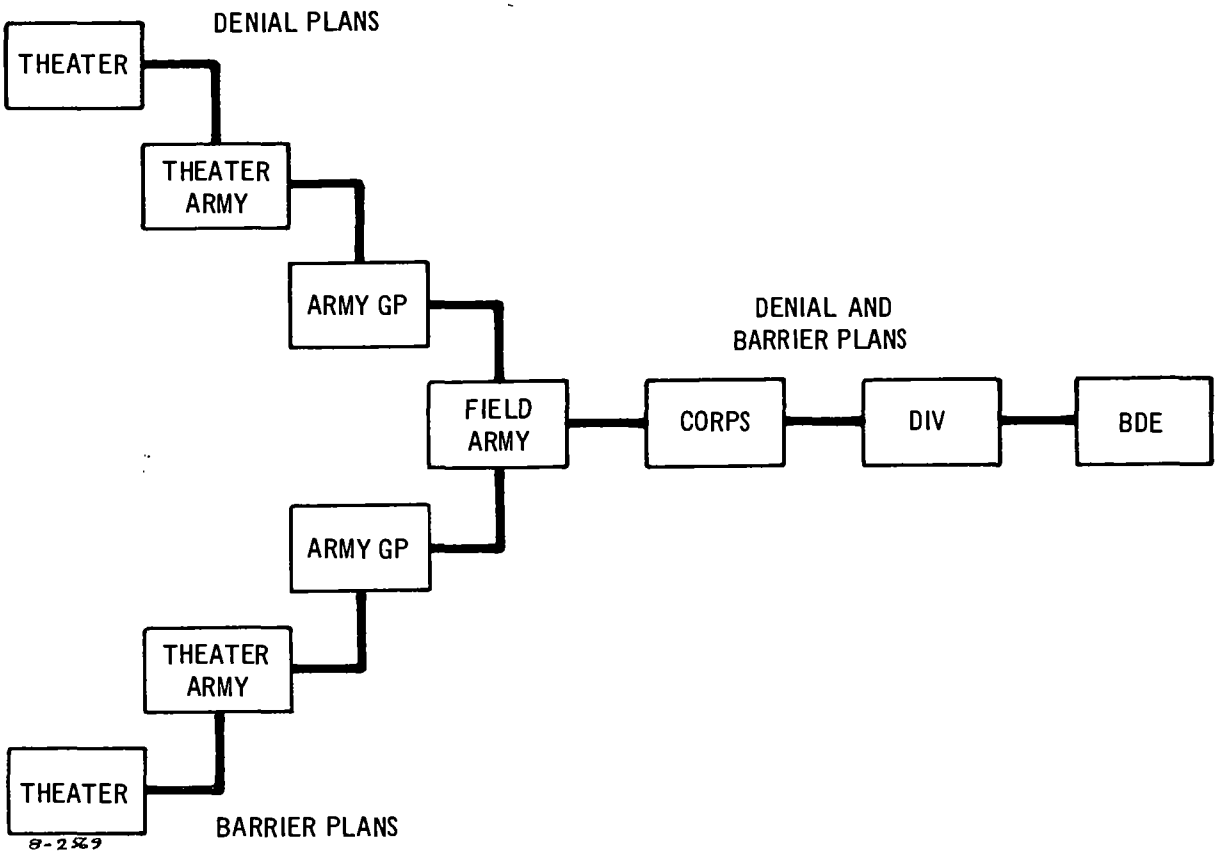


Figure 2–1. Integration of denial and barrier plans.

er permits his subordinate commanders maximum latitude in accomplishing the barrier (and denial) plan.)

(6) Code numbers of specified obstacles and code numbering system(s) for designating those individual obstacles specified by subordinate units. (This may be prescribed by SOP. Appendix B outlines a system of drawing the barrier trace and numbering artificial obstacles.)

(7) When deemed necessary, specific completion times for all or any portion of the barrier system; however, completion times can be specified later.

(8) Code system(s) for reporting the state of readiness of the individual obstacles, i.e., proposed (P), under preparation (U), ready but passable (R), and executed (E). (This may be prescribed by SOP.)

(9) Gaps, lanes, important routes to be kept open, and areas important to the command for tactical and combat service support operations as well as for future operations. (Gaps and lanes are specifically designated at the lowest level practicable in consonance with the mission of the command. For example, the field army normally cannot designate gaps or lanes in the divisions areas adequately and should not attempt to do so. The corps can do this. The field army designates gaps and lanes in the corps rear areas for the movement of the army reserve, for the relocating or shifting of units under army control, for combat service support activities, and for future operations.)

(10) Coordination required between adjacent units to insure that critical points (such as common boundaries) are effectively covered, and that gaps and lanes are properly located, sufficient in number, and not closed for passage before the time required.

(11) When deemed advisable and desired

by subordinate commands, authority for the construction of additional barriers.

(12) Limitations or restrictions on the employment of certain artificial obstacles, such as minefields, and boobytraps; chemical and radiological contamination; and atomic demolition munitions by type of area. (To guard against premature execution, restrictions may be placed on the employment of artificial obstacles. Higher headquarters may accomplish this by requiring subordinate units to request approval for the closure of specific gaps and lanes, or by retaining approval authority for clearance or release of control over specific routes prior to the destruction of bridges and other transportation facilities. The larger unit commander maintains surveillance over tactical operations and removes any restrictions imposed on the execution of obstacles as early as possible to allow subordinate units maximum freedom in operations. Restrictions on the use of defensive, barrier and nuisance minefields, or boobytraps may be necessary to prevent undue interference with future operations and to reduce casualties and loss of equipment.)

(13) Limitations on, and conditions for, the destruction of facilities of strategic importance, such as locks, dams, major bridges, and tunnels.

(14) Instructions regarding the submission of detailed barrier and obstacle plans for approval.

(15) Allocation of engineer support, labor (both troop and local), materials, transportation, and equipment.

(16) Restrictions, if any, on the use of local labor.

(17) Instructions on the security of the barrier plan.

(18) Reporting instructions. (Through reports, all headquarters in the chain of command keep abreast of the barrier situation and plan their operations accordingly. As a minimum, reports must include target or obstacle identification, location, and status designation.)

(19) Appendixes, as required. (Among the more important appendixes are the minefield (to include chemical mines) location plan; demolition plan; chemical, biological, and radiological contamination plan; and ADM plan. These appendixes establish the conditions under which each obstacle will be prepared, defended, and executed.)

2–9. Corps

a. The corps barrier (and denial) plan is based on the corps tactical plan and the field army barrier (and denial) plan. It is similar in content to the field army barrier (and denial) plan (para 2–8*b*), contains pertinent portions of that plan to include applicable denial targets, and includes additional barriers required for corps operations. It is more detailed than the field army plan because it is based on a better knowledge of the area and the study of detailed terrain analyses, maps, and aerial photographs. As a result, barrier traces usually are well defined.

b. The corps barrier (and denial) plan usually specifies a larger number of specific artificial obstacles (such as minefields and demolitions) by location and type than does the field army plan. However, the major subordinate units, i.e., divisions, armored cavalry regiments, separate mechanized or infantry brigades and engineer brigades and groups, accomplish most of the detailed planning. The corps barrier plan includes overprinted maps or overlays in sufficient detail so that subordinate units can understand the barriers that are to be installed. When appropriate, detailed plans for conventional demolitions; atomic demolitions; chemical and radiological contamination; and minefields are prepared. Corps coordinates the detailed planning of subordinate units, including their use of supporting weapons to cover barriers with fire. Appendix D contains an example of a corps barrier plan.

c. Corps integrates the maneuver, barrier, and fire support plans and plans the fires of corps artillery to cover important barriers after the troops actually defending them have withdrawn. When tactical air support is available, corps also plans its use to cover barriers with fire.

2–10. Division

a. Division barrier (and denial) plans de-

velop in greater detail the field army and corps barrier plans. They contain applicable portions of the corps plan to include assigned denial targets and such additional barriers and obstacles as may be required for division operations. Appendix D contains an example of a division barrier plan.

b. The division makes a detailed reconnaissance of its area of operations and determines the exact trace of each barrier; specifies the location and type of artificial obstacles best suited to the terrain; designates gaps and lanes; assigns target code numbers; prepares detailed bills of materials; and makes detailed estimates of the time, labor, transportation, and equipment required. When the division plan cannot be specific, subordinate units are directed to determine and report the remaining details.. Based on the complete plan, the division determines whether or not the location and type of obstacles suit the tactical scheme of manuever and the overall fire support plan. When conflict or disagreement occurs, the barrier (and denial) plan, the fire support plan, or the tactical scheme of maneuver—or all three—are modified to bring them into consonance. When coordination is complete, the information on each obstacle is consolidated, incorporated into appendixes to the barrier plan, and forwarded to corps. Corps reviews, coordinates, approves, consolidates, and publishes the appendixes to the barrier annex, and forwards them to field army. The final barrier (and denial) annex of each headquarters consists of a detailed plan, including the exact location and type of each obstacle and the unit responsible for its construction, security, and execution. All levels need this information because troop units may be rotated or shifted; and obstacles, once in place, restrict friendly as well as enemy movement.

c. Status reports are made through command channels as obstacles are constructed and executed. Detailed information on the location of each obstacle, combined with the status reports, keeps each level of command abreast of the situation. Each headquarters is responsible for keeping this information current and for informing interested agencies.

2-11. Brigades, Regiments, and Groups

a. Brigades, regiments, and groups usually determine much of the detail of a barrier (and denial) plan, perform the detailed terrain reconnaissance, and locate the artificial obstacles on the ground. They normally begin construction of individual obstacles, within authorized limits, without waiting for completion or approval of the barrier plan. The construction of barriers and the development of barrier plans are normally carried out simultaneously. Both continue as long as the area is occupied. Appropriate reports are normally submitted at the start of construction, completion of construction, and final execution of each obstacle. For minefields, a report of intent to lay is also required.

b. Complete barrier plans are not carried forward of division headquarters because of the danger of compromise. Division provides subordinate units with extracts of the plan in the form of fragmentary orders, overlays, and sketches.

c. Brigade, regiment, and group barrier plans include—

(1) Exact location and type of each obstacle by code number, including those specified by higher headquarters.

(2) A timetable and priority of construction for each obstacle.

(3) Labor and materials required for each obstacle.

(4) Specific assignment of units for construction, defense, and execution of each obstacle.

(5) Specific orders stating under what conditions and by whose authority each obstacle is executed.

(6) Routes to be kept open in accordance with the tactical and logistic plan, including those specified by higher headquarters.

(7) Exact location and extent of gaps and lanes, including those specified by higher headquarters.

(8) Identification of other headquarters with which coordination has been accomplished.

2-12. Construction

a. Combat Units. The unit commander is

responsible for construction of obstacles for close-in defense and security. These obstacles should be integrated into the barrier plan of the next higher command. Normally, each tactical unit is directed to construct that part of the barrier system that lies within its area of responsibility. Engineers furnish technical advice and supervision to units as needed.

b. Engineer Units. Engineer units are responsible for—

(1) Furnishing technical advice and supervision.

(2) Siting and constructing specific individual obstacles and/or barriers that—

(*a*) Require special skills and equipment.

(*b*) Protect flanks or rear areas.

(*c*) Benefit the command as a whole.

(*d*) Must be prepared before the arrival of the troops who are to occupy the area.

(*e*) Lie outside the area of responsibility of any tactical unit.

(3) Providing assistance in hauling barrier materials with organic transportation when directed.

(4) Furnishing tools, equipment, and materials to combat units and civilian laborers for the construction and execution of denial measures and obstacles.

2-13. Special Denial Teams

To facilitate coordination of the execution of obstacles and denial targets, it is desirable that, denial targets be destroyed by the same units responsible for the execution of barrier obstacles. However, higher headquarters may directly control the destruction of those technical targets which require specially trained personnel for proper destruction. In such cases, special denial teams or units are formed and assigned the denial mission. Detailed coordination with the subordinate tactical commanders is necessary to insure that destruction does not interfere with the operations of the troops responsible for the sector and that the special denial teams or units are adequately protected.

Section IV. PLANNING CONSIDERATIONS

2-14. General

Denial operations and the use of barriers are integrated into the scheme of maneuver, combat support to include fire support, and combat service support plans. The following factors are considered in the development of denial and barrier plans:

a. Mission of the command.

b. Denial instructions and barrier plans from higher headquarters.

c. Current and future plans. (These plans include operation plans, cover and deception plans, strategic and tactical air plans, psychological operation plans, and unconventional warfare plans.)

d. Enemy limitations and the effects of these limitations on his capabilities. (This factor includes critical shortages, weaknesses, dependence on facilities within the area of operations, ability to counter barriers, and strategic and tactical effects of denial operations.)

e. Weather conditions. (Weather conditions materially affect the terrain, the use of atomic demolitions munitions, and chemical contaminants.)

f. Terrain. (Artificial obstacles must be effectively tied in to natural obstacles to increase the effectiveness of barriers and reduce the requirement for troops and barrier materials.)

g. Effect on the local population. (Excessive destruction may impose a tremendous repair mission and create adverse civilian reaction. Either effect could seriously hinder future operations and threaten the success of the mission. A sound military reason must exist before demolitions are used. Damage to churches, schools, hospitals, and historical and cultural structures should be avoided except in cases of overriding military necessity.)

h. Period of denial in the case of denial operations. (The period planned should not exceed, so far as practicable, the length of time an area is expected to be in enemy possession.)

i. Time, materials, labor, and equipment available.

j. Timing of obstacle and target execution. This is firmly controlled by the highest commander affected.)

k. Obstacle and target protection required to prevent enemy seizure.

l. Authority and responsibility for obstacle and target execution.

m. Requirements of friendly forces for the use of facilities designated as obstacles and targets prior to the execution of the employment of denial operations and barriers.

n. Availability of friendly guerrillas and covert resistance forces.

o. Alternate plans to insure the execution of the most essential obstacles and denial targets.

p. Capabilities of air, naval, and joint force commands to execute missions in support of the overall barrier and denial plan.

2-15. Denial Planning Considerations

a. The initial requirement in the formulation of plans for denial operations is a detailed assimilation of all available maps and intelligence pertaining to the area of operations. Pertinent intelligence is studied to determine the enemy's vulnerability to denial operations. The planner must analyze the area of operations, the military objectives, and the location, characteristics, and optimum denial period of specific denial targets. He must select targets with care to insure that the enemy cannot readily compensate for their denial. The planner then selects those key elements of each target that should be attacked to make it inoperative for the predetermined optimum denial period. The planner's goal is to select those industrial, logistic, and communications systems that are most vital to the enemy's long-term operations and that—

(1) Disrupt his logistic support.

(2) Require the diversion of major effort to reconstruction and rehabilitation.

(3) Prevent the use of local materials, supplies or facilities necessary for continued operations.

(4) Force all necessary supplies especially heavy or bulky items such as POL and ammunition to be transported over long and frequently disrupted lines of communications.

b. The destructive work required for denial operations must not be confused with that required for a barrier system. Both involve extensive destruction and both may require destruction of the same facility. Consequently, there is an overlapping of objectives in the two plans. Normally, tactical targets of interest to a tactical commander in accomplishing his mission are included in the barrier plans of division, corps, and field army, unless restricted by specific orders or policies of higher commanders. Responsibility for destruction of these barrier targets flows through command channels. Responsibility for some significant tactical and strategic denial targets requires coordination at all levels of command since specific targets may be of such overwhelming importance to the theater, theater army, or army group commander's mission that he is unwilling to delegate authority for destruction. For example, highway and railway bridges crossing a major unfordable river may be of such strategic importance that a higher commander is willing to isolate some of his troops, perhaps a brigade, on the enemy side of the river rather than risk capture of the bridge intact. On the other hand, a division commander probably would consider blowing the same bridges only after the bulk of his division was safely across.

c. The theater commander includes in his denial plan, instructions for the execution of specific denial missions. He may employ specially trained teams or task forces under his control to destroy all significant strategic targets and make the field army and its subordinate commands responsible for destruction of significant tactical targets. Thus the commander with primary interest in each type of target directs preparation and destruction of the target and overlapping of responsibility does not occur. On the other hand he may assign responsibility for executing all denial target missions to the subordinate commanders in whose areas the targets are located. When he assigns the responsibility to subordinate commands he also provides when necessary specially trained denial teams to each echelon of command concerned to execute, advise, or assist in the destruction of technical targets.

d. The actual organization and method for conducting denial operations are governed by the technology of the targets. Some denial targets are so highly technical that special units must be organized and trained for the task. Other targets are so simple that any military unit can accomplish the required task with no more preparation than receipt of an order. In general, however, execution of denial target missions requires some technical or special training. The decision on the organization and method adopted is made only after a careful analysis of the factors involved, including the adequacy of communications. When adequate communications are not available, authority for execution of all denial target missions must be delegated either to the tactical commanders in the area concerned or to liaison personnel stationed at the target site.

e. In considering the techniques or options open to a commander in denying an area or object to the enemy, full consideration should be given to the doctrine contained in FM 31–55 (TEST). This manual provides guidance for commanders who must employ certain types of munitions, sensors, and monitoring equipment in order to secure, deny, or delay objects or areas to the enemy.

2–16. Barrier Planning Considerations

a. Barrier Studies and Plans. Barriers are planned and developed in two different but related phases according to the level at which the planning is conducted. At army group and higher headquarters, broad barrier studies are made as a part of long-range planning. At field army and lower echelons, barrier plans are prepared as a part of normal operational planning. Although a barrier study and a barrier plan are closely related, they differ in purpose, scope, content, and degree of finality.

(1) *Barrier study.* A barrier study is designed to determine the most effective use of natural and artificial obstacles. It is based on a study of the terrain and a broad concept of future operations in the area. It recommends barriers, artificial obstacles that are significant to the command as a whole, priorities, and allocation of tasks, and it forms a basis for barrier plans. The study is explanatory and points out the area potential for retrograde, defensive, or offensive operations correlated with a barrier system. The barrier study presents conclusions and recommendations for the best use of the terrain in a barrier system, provides a basis for developing tactical and logistic concepts and plans for the area, and is a framework for a barrier plan. It is complete, carefully prepared, and detailed.

(2) *Barrier plan.* A barrier plan is that part of an operation plan (order) that is concerned with the employment of obstacles to assist in accomplishing a specific operational mission. A barrier plan is limited in scope and is more definitive than a barrier study. The plan is based on tactical concepts that have been adopted, and not necessarily on those recommended by the barrier study. The barrier plan supports tactical plans and is carefully integrated into all operations. A barrier plan is normally issued as an annex to the operation plan (order). A barrier plan becomes a barrier and denial plan when it includes denial targets that have been assigned by higher headquarters. Appendix D contains a general format for a barrier annex with sample appendixes.

b. Barrier Location.

(1) A barrier system is a coordinated series of related barriers located in depth and designed to canalize or stop enemy movement and to aid in the accomplishment of the unit mission. Within a barrier system, individual barriers are located to make maximum use of all natural obstacles. Natural obstacles are as important as observation, fields of fire, communications, and concealment since, to a considerable degree, they determine the strength of a barrier system. Natural obstacles aid in blocking an enemy approach and may force him either to move slowly and laboriously through the natural obstacle or to seek a bypass thereby permitting friendly forces to concentrate fires on more trafficable terrain approaches, while covering natural obstacles with reduced forces. Locating barriers along streams, ridges, swamps, lakes, and similar natural obstacles and linking them with arti-

ficial obstacles reduces the resources required to achieve a barrier system.

(2) In a defense in depth, barriers are located on avenues of approach to assist in controlling key terrain. Intermediate barriers and obstacles are located where they can delay, canalize, or confine penetrations of the forward barrier and provide depth to the barrier system. Sufficient obstacle-free areas covered by fire must be provided to preclude interference with the planned maneuver of friendly forces, counterattacks, rear area protection (RAP) operations, movements of reserves, and combat service support activities.

(3) Artificial obstacles are located where natural obstacles are nonexistent or inadequate. The types of artificial obstacles employed are carefully selected to fit the terrain, to support the mission, and to employ available resources.

(4) Barriers in both the forward and rear portions of the combat zone are located where they can be covered with flat-trajectory fires. If this is not practicable, they are covered by observation and/or artillery, mortar, or other fire support means.

(5) Adequate communications and plans for rapidly shifting forces and supporting fires must be provided to threatened areas in the rear portion of the combat zone.

(6) To increase the surprise and deception, individual obstacles within barriers are hidden from enemy observation whenever possible.

(7) It is not always necessary that barriers be located where they are more difficult to bypass than they are to breach. If the tactical purpose of the barrier is to canalize enemy movement, the barrier is located and constructed so that the enemy will have greater difficulty in breaching it than in bypassing it.

c. Barrier Depth. Barriers must be employed in depth if they are to endure a determined enemy assault. The destructive power of nuclear weapons makes it possible for an enemy to penetrate any single barrier and defense. The maintenance of strong defense garrisons in the rear portion of the combat zone to prevent the enemy from exploiting breakthroughs usually is not practicable. Successive barriers in a cellular pattern, combined with intermediate obstacles in depth, will slow or limit enemy penetrations; permit greater relative freedom of maneuver by friendly forces; and provide time for the defenders to regroup and counterattack. Successive barriers require the enemy to expend strength and time at each barrier and may compel him to concentrate and thus offer lucrative targets for massed artillery fires or nuclear weapons. The width and depth of a specific barrier are not fixed but are based on its purpose, the tactical situation, and the resources available. The distance between barriers is an important consideration. If barriers are located too close together, they become one barrier rather than two. If located too far apart, they permit the enemy to consolidate his gains before assaulting the next barrier. Although the specific location of barriers depends on terrain, as a general rule they should be far enough apart to allow reserves time and space to counterattack.

2-17. Priorities

a. Denial Operations. Because of the magnitude of denial operations and the limited time and means normally available, missions are given priority in the order in which they contribute to the overall operation. Those with the greatest immediate effect in reducing the enemy's combat effectiveness in the battle area generally have priority over those that have delayed or long-range effects. For example, the denial of major airfields, bridges, or bulk POL when tactically essential to the enemy takes priority over the denial of major industrial facilities.

b. Employment of Barriers.

(1) Operational requirements and logistic capabilities are key considerations in establishing priorities for barrier construction and for determining those elements to be deferred, curtailed, or eliminated. The commander makes his decision based on recommendations from the G3/S3 and the engineer, and on whether the barrier requirements are commensurate with the expected results. Seldom does the commander have enough time, labor, materials, transportation, or equipment to con-

struct all the barriers desired. Therefore, the feasibility of the barrier plan must be evaluated against all tactical and logistic requirements. This is particularly true in the defense because of the additional requirements generated by the construction of field fortifications, organization of the ground, and related tasks.

(2) Within the overall priority accorded the barrier system, individual barriers are placed in order of construction priority as determined by their contribution to the unit mission. Generally these priorities are from front to rear, with first priority normally assigned either to covering and forward barriers or to those barriers that protect a critical flank or block the most dangerous enemy avenue of approach. In the defense, the rear area barriers normally receive second priority.

(3) Within each barrier, individual obstacles are placed in order of priority, according to their expected contribution to the operation. Usually, the improvement of natural obstacles and the construction of positions to cover them by fire are first priority. The construction of artificial obstacles to link the natural obstacles into a barrier is second priority.

(4) Each element of the barrier is designed and constructed to provide time for the construction of succeeding portions. Usually demolition obstacles are not executed until the enemy closes on the obstacle or penetrates the battle area. As more obstacles are constructed, the number of troops available to work on succeeding portions of the barrier system tends to diminish because demolition firing parties and demolition guards must be provided for those obstacles that are not immediately executed.

(5) An optimum barrier system in the forward portion of the combat zone can seldom be achieved unless hostilities have not begun, defense of an area has been going on for some time, and natural barriers are effective by themselves or require only limited improvement or augmentation with artificial obstacles. Extensive barriers, which consist primarily of artificial obstacles, are not practicable. Conversely, extensive barriers are both practicable and necessary in the rear portion of the combat zone to help block deep penetrations and envelopments, to assist in forming massed targets, or to provide time and space for the maneuver of counterattack forces.

2–18. Flexibility

Denial and barrier planning is continuous. Plans must respond to changing situations. The weather, labor, combat service support, and tactical situation that exist at the moment a specific plan is executed may be quite different from those originally envisioned. A detailed barrier and denial plan may become infeasible because of changing enemy tactics or the introduction of additional enemy troops or new equipment. Each plan is reviewed constantly in the light of changing tactical concepts, situations, and capabilities of both enemy and friendly forces. It is essential that planning provide for expansion of barrier systems and number of denial targets as additional time, labor, materials, transportation, and equipment become available. This is particularly true in the forward portion of the combat zone, where time and labor are at a premium and the emphasis on the construction of barriers is likely to be limited to the strengthening of natural obstacles and the fabrication of only a few essential artificial obstacles.

2–19. Combat Service Support

a. General. The logistic support required for denial operations and barriers demands careful and detailed planning and close staff coordination. Because of the large amounts of materials, transportation, and equipment required for barrier construction and the specialized equipment and materials that may be required for denial operations, logistic staff planners must participate in barrier and denial planning from the inception of the operation.

b. Labor.

(1) A factor critical to the execution of a barrier plan is the availability of labor. All sources of manpower, including the local population when feasible, are utilized. To permit engineer troop effort to be used on more spe-

cialized tasks, substantial effort is required of the forward combat units and tactical reserves, particularly for strengthening natural obstacles.

(2) Mobile labor units, using military cadres and local laborer fillers, are formed into paramilitary organizations and used for much of the barrier construction in the rear areas; however, the size of the force that can be employed effectively may be limited by the number of supervisory military personnel available. Friendly guerrilla forces can construct portions of a barrier system in areas not under friendly control.

c. Supply Support. Denial operations and the employment of barriers require large quantities of supplies, such as tactical wire, timber, explosives, and mines. Long-range combat service support plans must be made to insure that adequate stocks of supplies are available. FM 54–2, FM 54–7, and FM 54–3 contain a discussion of supply procedures.

CHAPTER 3
DENIAL OPERATIONS AND EMPLOYMENT OF BARRIERS

Section I. GENERAL

3–1. Denial Operations
The basic principle in the employment of denial operations is the increase of combat effectiveness of available forces. Denial operations attack an enemy's lines of communications and inhibit his moving beyond the area he has occupied. Vital facilities, areas, or installations that are damaged or destroyed to deny the enemy their use for an extended time, delay the enemy and weaken his combat striking power. Denial operations and barriers also influence enemy morale. This psychological benefit, not easily measured, reduces the enemy's effectiveness.

3–2. Use of Barriers
The employment of barriers is not restricted to any one type of tactical operation. Although barriers are defensive and have greatest application in defensive and retrograde operations, they can be gainfully employed in other military operations. The basic principle in the use of barriers, as in the employment of denial operations, is to increase the combat effectiveness of available forces. Barriers are one of the more important tools of combat support available to the commander to assist him in controlling the enemy. The commander who skillfully knits natural and artificial obstacles into barriers changes the military characteristics of the terrain to fit his tactical plans. He increases his chances for gaining relative superiority in mobility and enhances security and permits economy of force, thus permitting him to mass more effectively for offensive action. The effective use of barriers permits greater dispersion and reduces vulnerability to mass destruction weapons. Well-designed barriers cause the enemy either to concentrate and present a lucrative target or to seek bypasses.

Section II. THE OFFENSE

3–3. Offensive Operations
Denial operations and barriers are employed with each of the forms of maneuver: the envelopment, the penetration, and the frontal attack. They assist primarily in flank security. They can also impede enemy counterattacks, strengthen lightly held sectors as an economy of force measure, and assist in entrapping withdrawing enemy forces.

3–4. Flank Security
Barriers provide an effective means of increasing the flank security of the attacking force (fig. 3–1). Natural obstacles are reinforced, if necessary, and artificial obstacles are located to provide additional warning of, and protection from, enemy flanking action. The speed of the attack and time required for construction normally limit artificial obstacle employment after the attack has been launched. In fastmoving situations, barriers consist, as a minimum, of hasty roadblocks—mines, portable obstacles, and prepared demolitions, both conventional and atomic demolition munitions —located where defiles cross major terrain features. Aerially scattered minefields are also used to cover open areas of trafficable terrain between major natural obstacles. Nuclear surface and subsurface bursts and persistent chemical agents can also neutralize terrain that the attacking force does not intend to enter immediately. It should be noted, how-

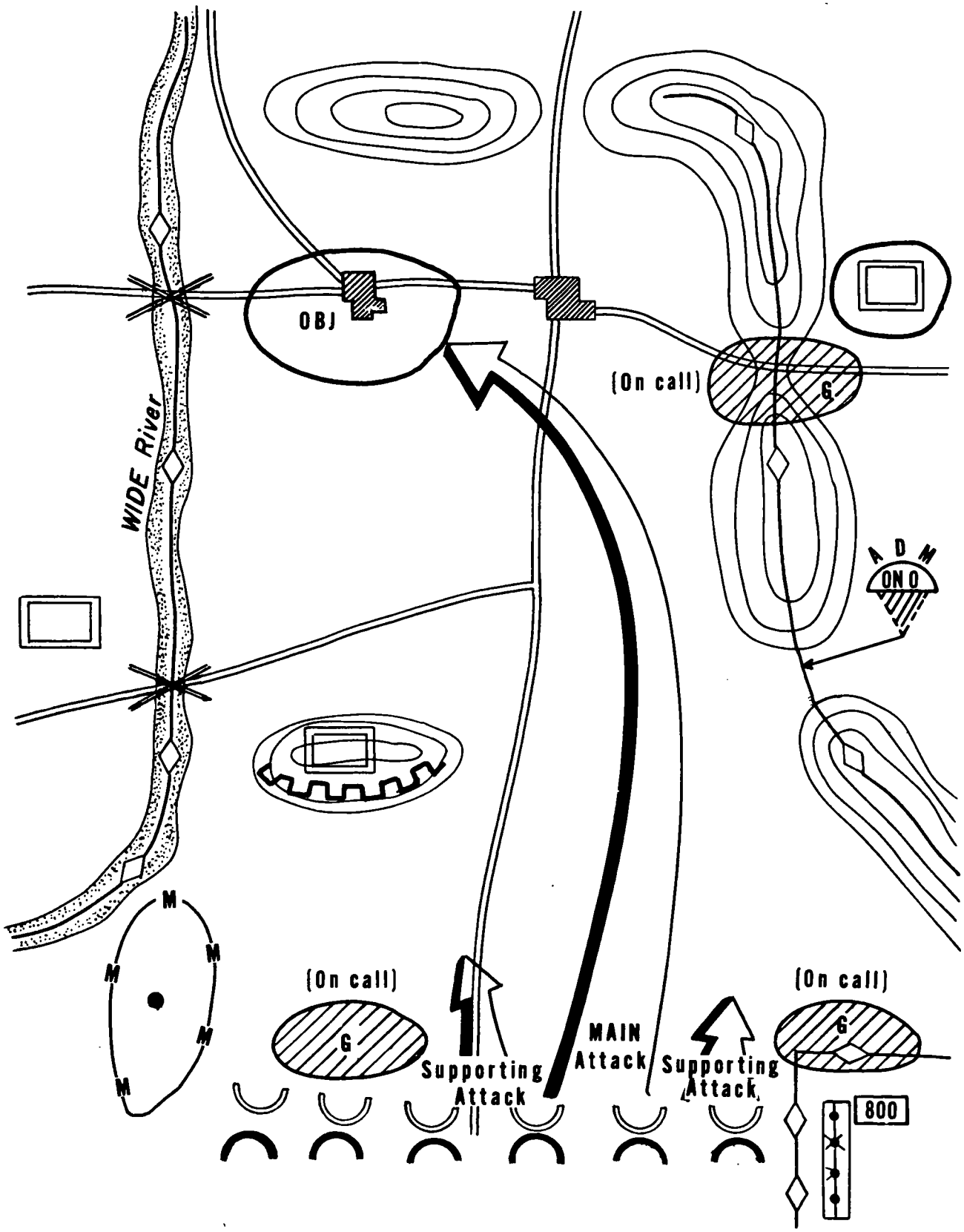


Figure 3-1. Use of barriers to provide flank security.

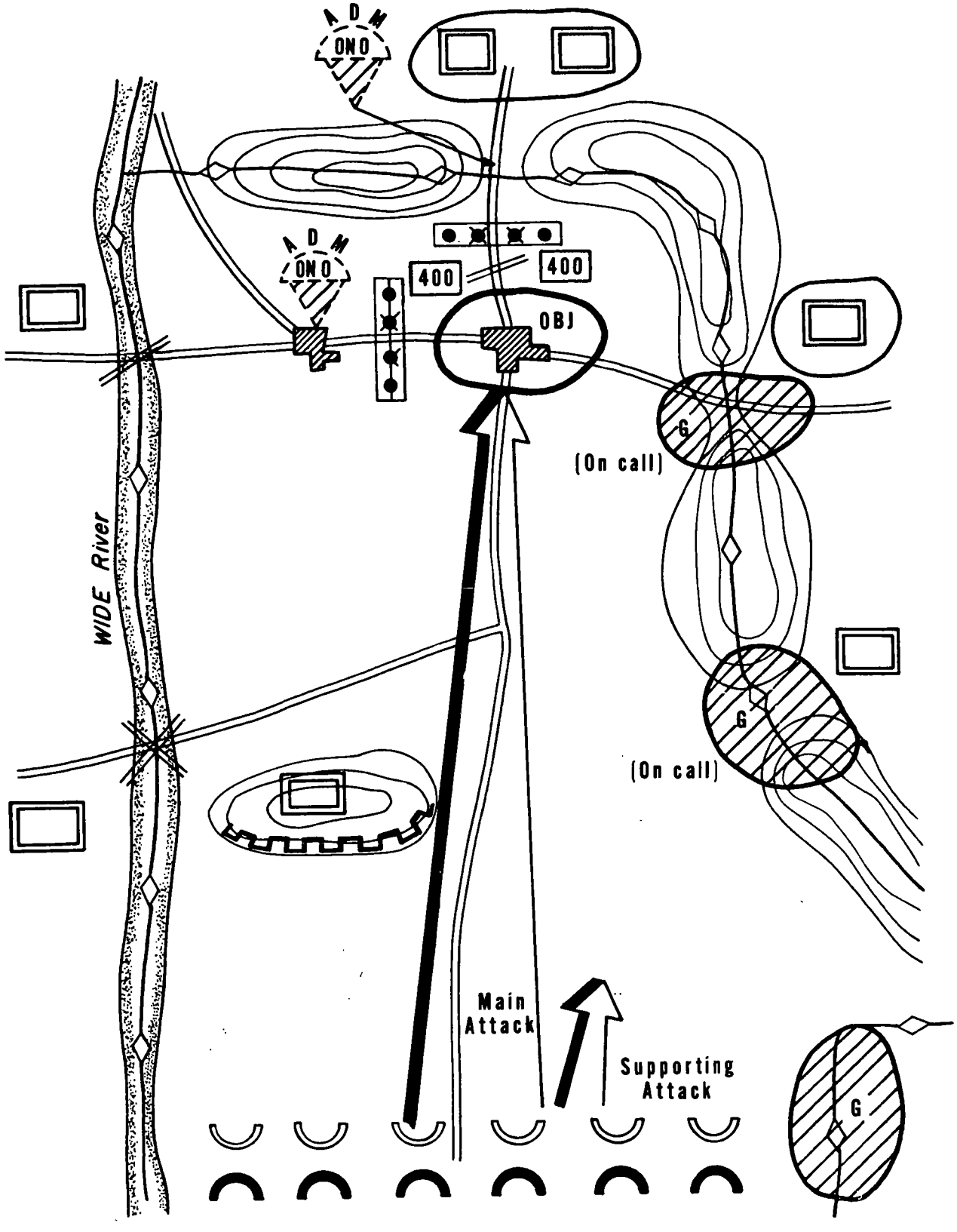


Figure 3-2. Barriers employed to impede counterattacks.

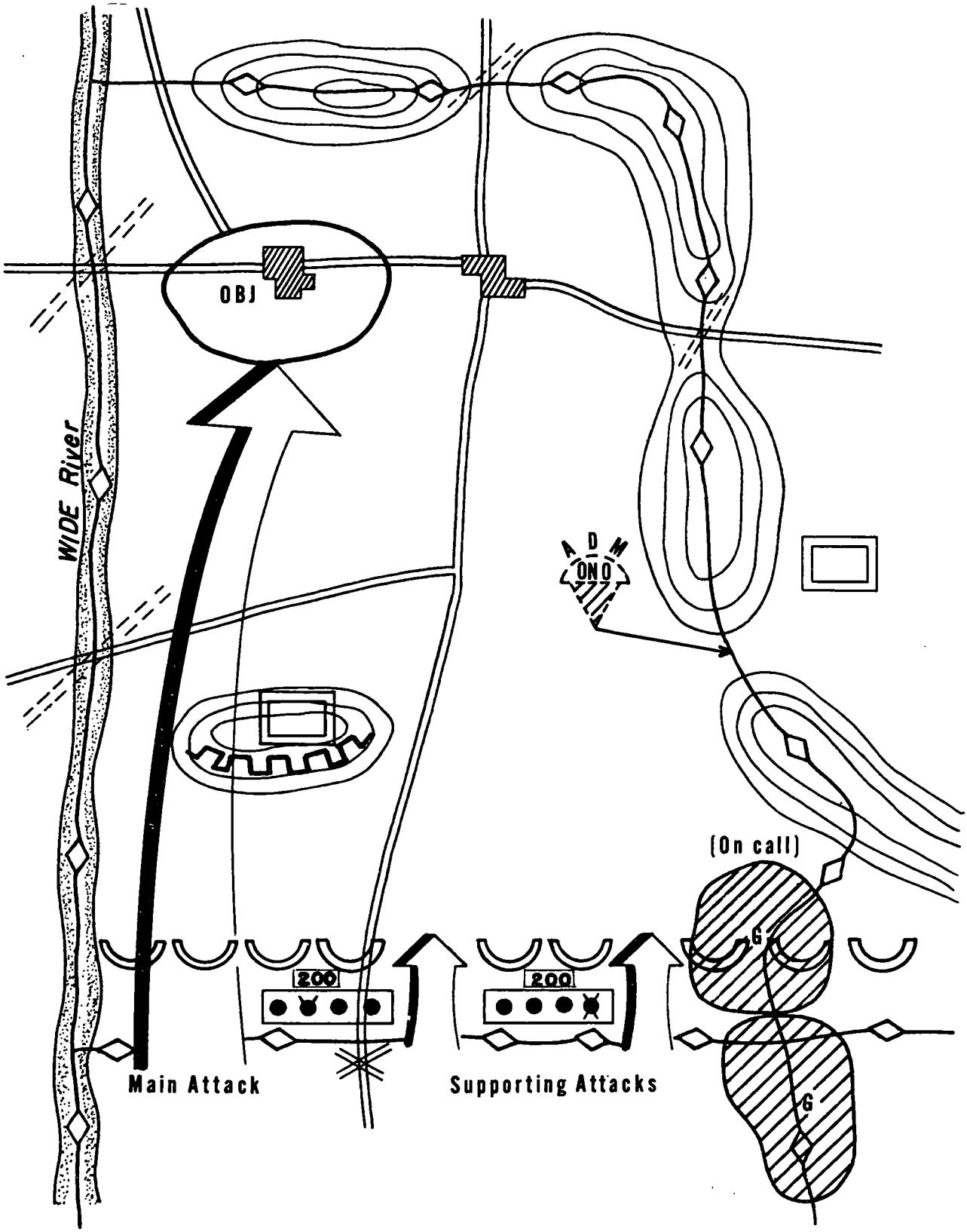


Figure 3–3. Barriers employed as an economy of force measure.

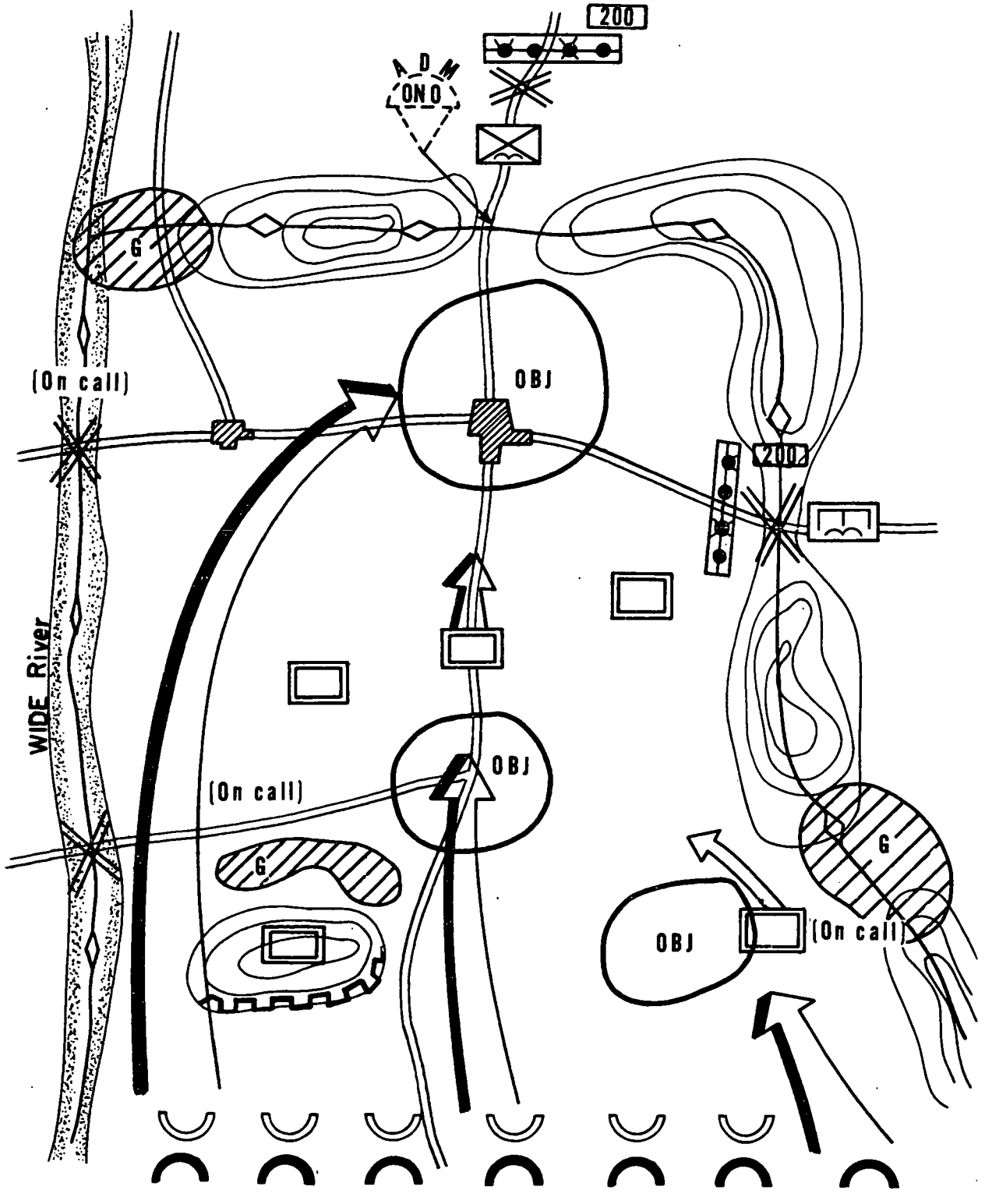


Figure 3–4. Employment of barriers in entrapment of enemy forces.

ever, that an intelligent, aggressive enemy is not delayed significantly by nuclear surface and subsurface bursts, except for the crater and the contaminated area immediately surrounding it. Barrier plans provide for strengthening the weak flank and rear barrier lines should a strong enemy threat develop in those areas.

3–5. Other Uses in the Offense

a. Impede Enemy Counterattacks. Barriers assist in impeding enemy counterattacks during the reorganization phase following the securing of an objective. Initial attack plans should include a barrier plan that outlines the use of natural and artificial obstacles to protect the advance of the command and to impede the movement of any known or suspected enemy counterattack force. Detailed coordination of this barrier plan with the plans for defending and protecting each successive objective is accomplished before the attack. During the attack and the reorganization of the objective, planned barriers are positioned as required, with priority to the positioning of the barriers on likely enemy avenues of approach. Because of the proximity of the enemy and the probable speed of his reaction, barriers consist of obstacles that can be positioned quickly, such as hasty barbed wire entanglements, protective minefields, hasty roadblocks, and prepared demolitions (fig. 3–2). Barriers are important in offensive operations when the attacking force lacks maneuver room and is faced with a numerically superior enemy, such as in the initial phases of river-crossing, airborne, and amphibious operations.

b. As an Economy of Force Measure. The effective use of denial operations and barriers permits a commander to withdraw forces from the zone of his supporting attack and to concentrate them in support of his main attack. Barriers can replace fire support and units that are withdrawn, thus filling the gaps between units remaining in the zones (fig. 3–3). Persistent chemical agents can be used to hinder the enemy's use of areas not occupied by friendly troops.

c. Entrapment of Enemy Forces. Denial targets and barriers are employed to fix the enemy in position and to block or canalize his withdrawal. Barriers are placed in the enemy's rear and may consist of minefields or persistent chemical agents laid by aircraft; demolitions and other obstacles constructed by air-mobile forces, airlifted demolition teams, or friendly guerrilla forces; and artillery and tactical air interdiction, including deliberate surface and subsurface nuclear bursts. The use of barriers for entrapment is coordinated with artillery, tactical air, and friendly guerrilla operations, as well as with planned future operations. This coordination prevents duplication of effort and insures the denial of all avenues of escape to the enemy without impeding friendly offensive maneuver (fig. 3–4).

Section III. THE DEFENSE

3–6. Defensive Operations

a. The purposes of defensive operations are to gain the time necessary to develop more favorable conditions for offensive action, to economize forces in one area of the battlefield in order to concentrate superior forces for a decisive action elsewhere, to destroy or trap hostile forces, to reduce enemy capability of offensive action, and to deny a vital area to an enemy force. All means and methods are employed to prevent, resist, repulse, or destroy enemy attacks against the defensive position. The fundamental forms of defense are the mobile defense and the area defense.

b. FM 100–5 contains a general discussion of the principles of defensive operations.

3–7. Elements of Denial Operations and Barriers

a. General. Denial operations and barriers are employed to—

(1) Delay and disrupt the enemy's advance toward the front or flanks, thereby increasing his vulnerability to defensive fires (fig. 3–5).

(2) Delay, limit, or canalize movement of penetrating or enveloping enemy forces, thus providing time to bring defensive fires

to bear on the threat and/or organize and launch counteroffensive action (fig. 3–6).

(3) Permit economy of force.

(4) Assist in flank and rear area security.

b. Types of Barriers. The types of barriers used are covering barriers, forward barriers, intermediate barriers, rear barriers, and flank barriers (fig. 3–7).

(1) *Covering barriers.* A covering barrier is located forward of the battle area and is emplaced when units are not in actual contact with the enemy and when withdrawing to a defense area to the rear. It is selected by a field army, corps, or division to assist the delaying actions of covering forces, rearguards, and security forces. It consists of obstacles designed to slow the initial enemy thrust, separate tanks from infantry, and deceive the enemy as to the location of the main battle area. Covering barriers are not necessarily continuous but may consist of groups of coordinated obstacles in depth across the enemy's major avenues of approach. Because of the limited time available to construct covering barriers, as well as the limited size of the security forces, emphasis is placed on the use of natural obstacles reinforced with artificial obstacles that can be quickly and easily constructed, such as demolitions (conventional and atomic demolition munitions), nuisance mining (when authorized), hasty roadblocks of all types, and abatis. Covering barriers may be employed along international borders to provide early warning and to delay an invading force that is capable of striking without either warning or declaration of war.

(2) *Forward barriers.* A forward barrier is located generally along a forward division's initial battle position. It consists of the defense areas and strongpoints in depth, coordinated fires of all weapons, and artificial and natural obstacles employed in depth for close-in protection and defense. It is not necessarily a continuous field of antitank and antipersonnel mines but combines all types of obstacles, both natural and artificial, and the fires of all weapons. It is sited on the strongest terrain features available and is the backbone of the defense. Depth to the forward barrier can be achieved by using a series of obstacles on the dangerous avenues of approach. These obstacles are covered by forces along the forward edge of the battle area (FEBA). Intermediate obstacles are placed in depth throughout the division's defense area, including rear defense areas and blocking positions. In establishing a forward barrier, units analyze the terrain to determine those areas that prevent the movement of tanks or permit their passage only with great difficulty. Although each defense area is founded on the strongest combination of terrain features available, all areas may not be equally strong. When portions of the forward barriers are located on vulnerable terrain, the natural vulnerability of the terrain is reduced by using all types of artificial obstacles and coordinated defensive fires.

(3) *Intermediate barriers.* Intermediate barriers are those that are located between the forward and rear barriers, or between units that are smaller than division size. They are developed initially by construction of narrow minefields, abatis, road craters, and bridge demolitions, and other obstacles at random as time, labor, materials, and transportation become available. Individual obstacles are sited where natural obstacles (such as forests, unfordable streams, swamps, and escarpments) prevent easy bypassing. In time, these individual obstacles are connected as intermediate barriers to form a rough cellular pattern. Thus the enemy is encircled by barriers. Intermediate barriers permit penetration of the forward barrier without jeopardizing the entire battle area and assist in canalizing enemy forces into preselected target areas.

(4) *Rear barriers.* Corps, field army, or higher command select rear barriers. Their purpose is to assist in the organization of a rear battle area and to prevent or slow deep enemy penetrations or wide envelopments. The principles for locating and constructing rear barriers are the same as for forward barriers. Artificial obstacles are used more extensively in the construction of rear barriers, since time, materials, transportation, equipment, and specially trained personnel are more readily available in rear areas.

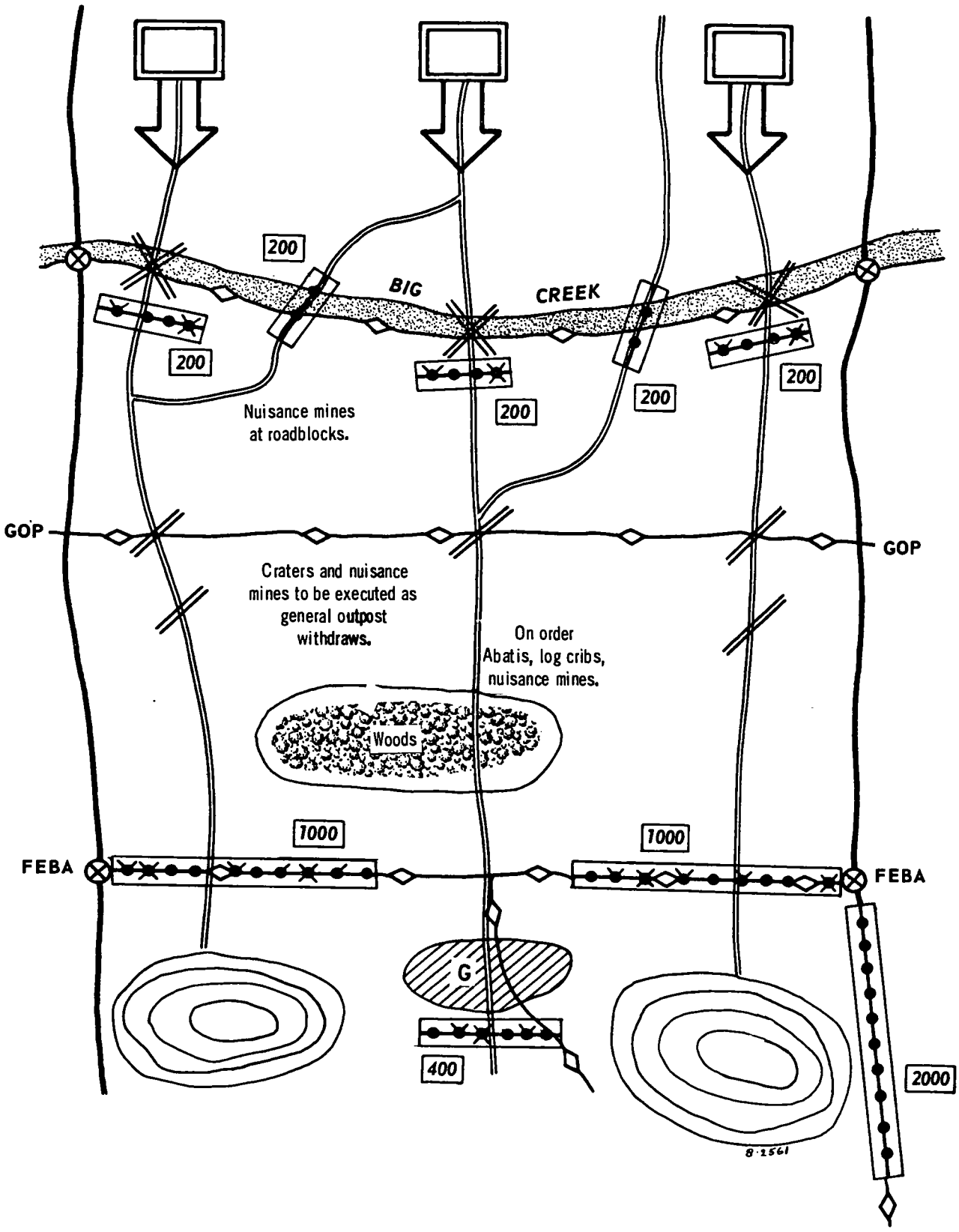


Figure 3–5. Barriers employed to delay enemy advance.

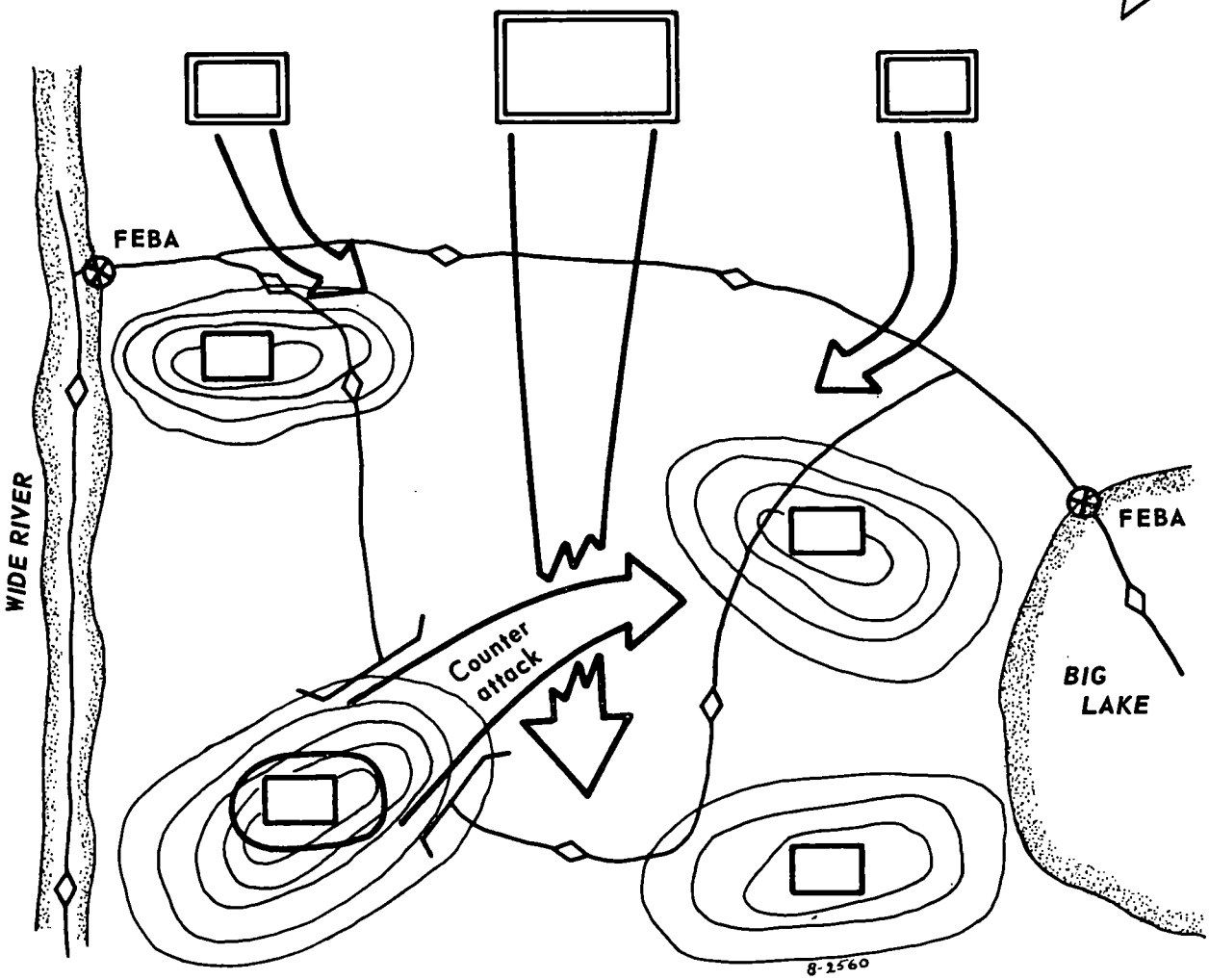


Figure 3–6. Barrier employment to limit or canalize enemy attack.

(5) *Flank barriers.* A flank barrier is located to protect the flank of a division or larger unit and to prevent or slow enemy penetrations and envelopments. The principles of locating and constructing intermediate obstacles and barriers are applicable to flank barriers.

c. Gaps and Lanes.

(1) Gaps and lanes provide a means of access through barriers. A gap is a portion of a barrier in which no obstacles have been constructed. It is wide enough to enable a friendly force to pass through in tactical formation. A gap seldom is less than 100 meters wide. A lane is a clear route through an obstacle and is generally a road or path. Single lanes are normally 8 meters wide, and double lanes are 16 meters wide. Gaps and lanes are left in the barrier system as required for the movement of reserves, combat service support activities, and future operations.

(2) Gaps and lanes generally are designated and controlled by the echelon that commands units on both sides of a barrier or

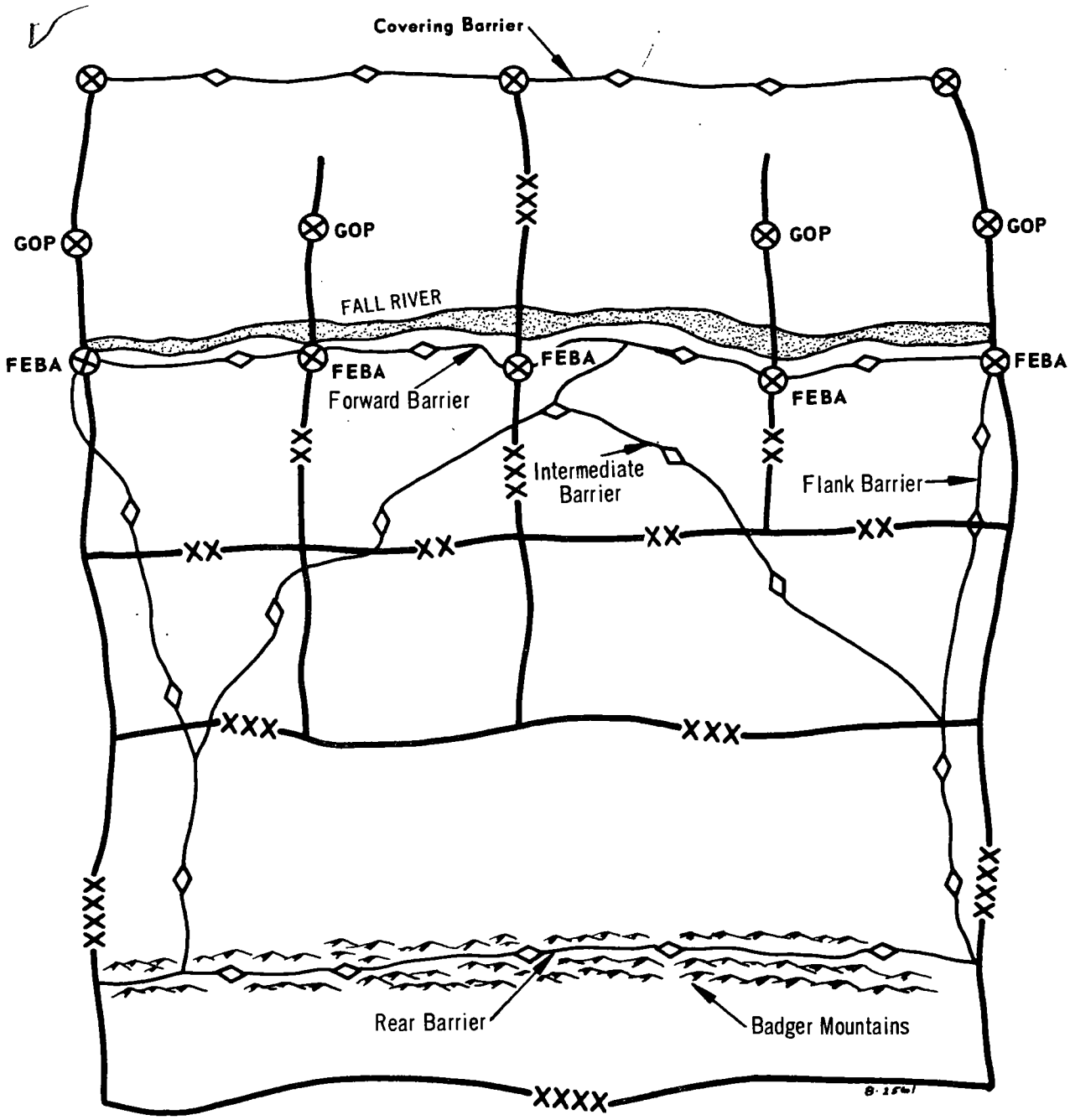


Figure 3–7. Barriers employed in the defense.

obstacle. In all cases, gaps and lanes are designated at the lowest possible level. For example, covering force units designate and control gaps and lanes in the covering barrier. Divisions on the forward edge of the battle area designate and control gaps and lanes in the forward barrier; however, until the covering force has withdrawn, the corps commander controls those gaps and lanes on the forward barrier that are to be used by the covering force. Field army designates gaps and lanes in the field army service area. Field army also specifies gaps and lanes in barriers in the

corps areas as required for the movement of reserves and for logistic activities.

d. Development of a Defensive Barrier System.

(1) Chapter 2 contains a discussion of the general planning of a barrier system and development of the barrier plan. Denial targets and obstacles are integrated into the barrier system. In a defensive situation, the pattern for progressive construction of a barrier system is as follows:

(*a*) Artificial obstacles are located and tied into natural terrain barriers so that they block in depth the most important avenues of approach into and through the defense area.

(*b*) Other artificial obstacles, also tied to natural terrain barriers, are sited in depth across important avenues leading into flanks of the defense area.

(*c*) Artificial obstacles are extended laterally along natural terrain barriers by blocking all routes that offer ready bypasses on either side of existing natural obstacles. In this manner, obstacles are coordinated and barrier lines are formed.

(*d*) The lateral extension of barriers across the front and flanks of the defense area is completed by blocking the remaining avenues of approach and by extending minefields across tank-favorable terrain. This closes all openings in the barriers through which tanks can pass and serves to separate enemy armor and infantry.

(*e*) At each stage of development, barriers are coordinated with all defensive fire plans for flat-trajectory weapons, mortars, artillery, and tactical aircraft. Arrangements are made to keep the barriers under constant surveillance and covered by fire.

(*f*) At each stage of development, barrier plans are coordinated with both counterattack plans and future plans for resuming the offensive to insure that—

1. Adequate gaps and lanes are provided in each barrier to allow freedom of movement by friendly forces.

2. Construction parties and, when necessary, security guards are designated and available to close gaps and lanes promptly when required by the tactical situation.

3. Appropriate quantities and types of materials are available and stockpiled at or near gaps and lanes so that they may be closed as required. Aerially delivered mines should be considered for rapidly closing wide gaps.

(*g*) At each stage of development, approved denial targets that are integrated into the barrier plan are coordinated with the headquarters directing the target execution. This is done to insure that special equipment, personnel, and materials required are on hand when needed.

(2) Subject to restrictions imposed by higher authority, construction of obstacles and barriers commences without delay at all echelons, without waiting for completion of the barrier plan. As long as a unit remains in a defense area it continues to improve individual obstacles and barriers. Completion times specified for barriers or obstacles indicate only the minimum required construction and do not preclude further improvement and refinement.

Section IV. RETROGRADE MOVEMENTS

3–8. Retrograde Movements

a. A retrograde movement is any movement of a command to the rear or away from the enemy. The underlying reason for each movement is to sacrifice terrain to gain time or more favorable conditions for combat while harassing, exhausting, and inflicting maximum punishment on the enemy. Retrograde movements may be voluntary or may be forced by the enemy.

b. FM 100–5 and FM 61–100 contain a general discussion of the principles of retrograde movements.

3–9. Denial Operations

a. Denial operations are of prime importance in retrograde movements. They seek to reduce the enemy's capability to continue the attack and to reestablish favorable conditions for friendly counteroffensive action. Denial operations gain time and reduce the enemy's will and ability to continue combat by denying

him the use of key areas and by rendering inoperative transmission lines, bridges over major rivers, ferries, foundries, factories capable of producing war material, abandoned equipment, airfields, railway equipment and facilities, highways, and bulk POL stocks that cannot be evacuated. Denying the enemy any benefit from transportation, industrial, or communications systems along the routes of withdrawal disrupts his logistic support, limits his ability to maneuver and exploit successes, and reduces his ability to advance.

b. In retrograde operations, military equipment, is evacuated if possible; otherwise equipment is destroyed rather than being abandoned to the enemy. Unit standing operating procedures will provide for the emergency evacuation or destruction of excess supplies and equipment. When possible, mobile equipment is demolished in defiles, on airfield runways, or in other locations where it assists in delaying the enemy.

3-10. Employment of Barriers

a. General. In retrograde operations, barriers are used to assist planned withdrawals to successive delay positions or to rear battle areas. They can impede the enemy advance, economize on forces, and gain time. The effectiveness of barriers in delaying the enemy can be increased by the use of tactical air to hamper enemy pursuit, interdict routes, and deny enemy logistic support. Barriers are not necessarily continuous but may consist of a series of coordinated obstacles located in depth on likely avenues of enemy approach. They extend across the front of the delay position, and cover the flanks and rear of the position. The protection of the flanks and rear is of particular importance when the enemy has freedom of maneuver and greater mobility than the delaying forces. Barriers are used to slow down and confuse the enemy and to disrupt his planned maneuver. Barriers also canalize his movement and delay or stop his attempts to penetrate the position. Barriers assist in giving early warning to the delaying force commander, thus providing time to move friendly reserves and fires to threatened locations. They also assist in deception by giving the enemy the impression that the delay position is held in strength (fig. 3-8).

b. Preplanning of Barriers. When possible, barriers are preplanned in retrograde operations. Friendly withdrawal routes and major routes of enemy advance are predicted. The terrain is thoroughly analyzed, to include both natural and manmade features, weaknesses in natural obstacles are determined, the best types of artificial obstacles are selected, the blocking of probable routes of enemy advance is insured, and the necessary resources are secured.

c. Types of Barriers Employed. The types of barriers employed are essentially the same as those employed in the defense. Covering barriers are used forward of the defense area and generally cover a larger area than in the defense. Paragraph 3-6 contains a discussion of the employment of barriers in the defense.

d. Obstacles. The length of time a delay position is to be occupied and the labor and materials available influence the type of obstacles and the amount of construction. Obstacles most commonly employed are nuisance mines, minefields, flame field expedients, abatis, hasty road craters, bridge demolitions, masonry building demolitions in towns, and contaminated areas. Nuisance mining of locations suitable for enemy artillery gun positions, assembly areas, command posts, and communications centers, as well as along routes of advance, assists in delaying the enemy advance. It may not be necessary to mine all suitable areas and routes: enemy units that have previously suffered casualties from nuisance mines tend to delay forward displacement until all areas or routes have been checked or cleared. In retrograde actions, commanders carefully consider both demolition and mine warfare policy in relation to the purpose of the operation and the future plans of the command as a whole. During a forced withdrawal, time will be at a premium and units will rely extensively on natural obstacles; during a planned withdrawal, artificial obstacles will be used more extensively. Widespread demolition and nuisance mining may become a greater handicap to friendly forces during a future counteroffensive through the same area than a hindrance to the enemy during friendly retrograde movement.

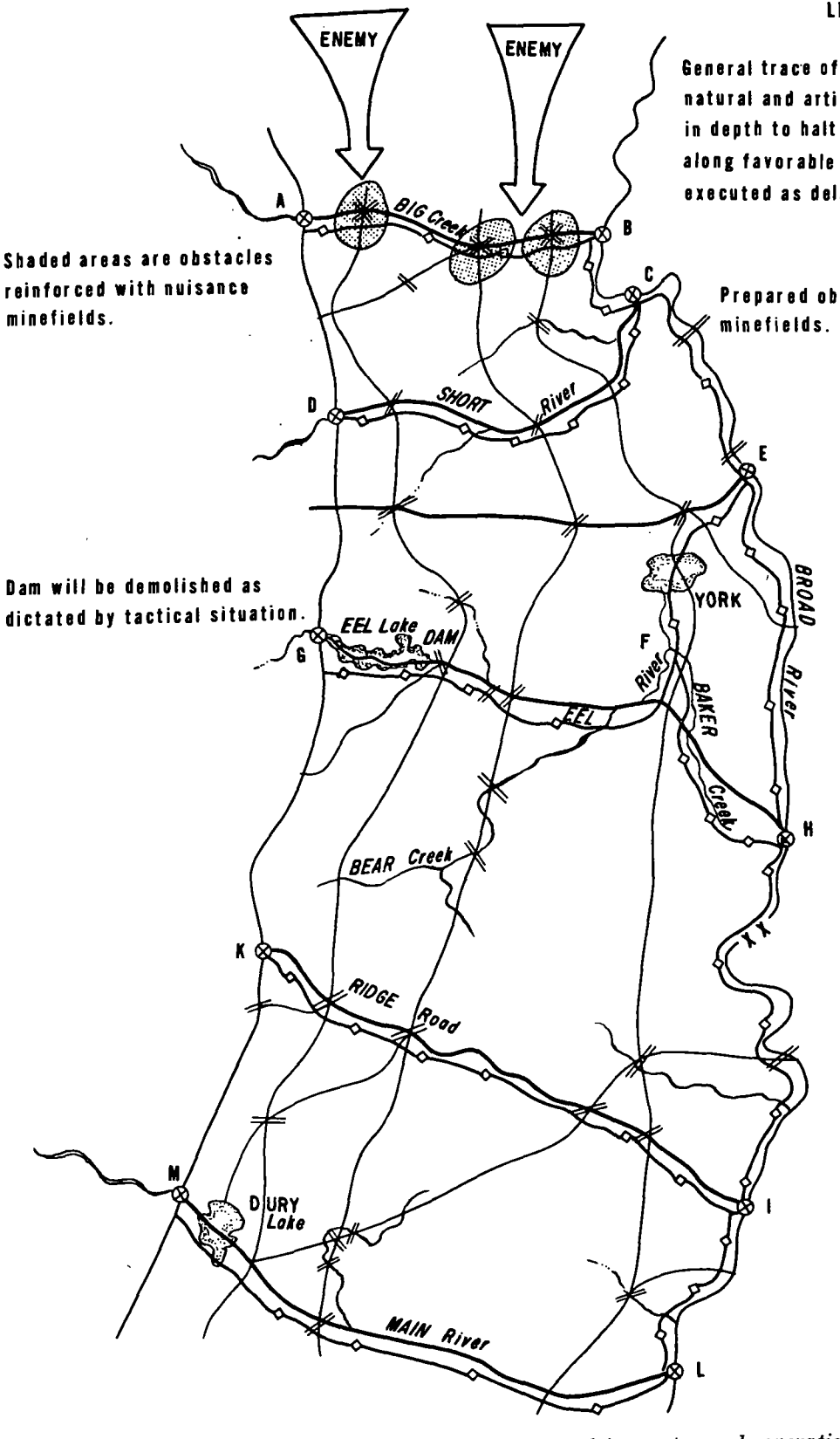


Figure 3-8. Barriers employed in a retrograde operation.

Section V. RELIEF OF COMBAT TROOPS

(The material presented in this section agrees with STANAG 2082, Relief of Combat Troops. FM 100-5 contains additional information on relief operations.)

3-11. Relief in Place

The three principal types of relief operations are a relief in place, a passage of lines, and a withdrawal through a rearward position. In a relief in place the incoming unit must fit into and accept the general defense plan of the outgoing unit until passage of command. The relieving unit must be thoroughly briefed on existing barriers and the fire support plans for each barrier. Once the relief has been ordered, the unit to be relieved should not install additional obstacles in the barrier without coordinating with the relieving units.

3-12. Passage of Lines and Withdrawal Through a Rearward Position

In a passage of lines and a withdrawal through a rearward position, units must avoid presenting profitable nuclear targets. By the effective use of barriers, the relieving force can disperse without weakening its defensive posture. The layout of the defensive position, available fires, barriers, security, vulnerability, and subsequent mission must be considered in selecting points through which to pass. When possible, routes of withdrawal or passage, particularly for armor, should avoid locally prepared defensive positions.

Section VI. OTHER TACTICAL OPERATIONS

3-13. General

The general principles regarding denial operations and barriers in offensive, defensive, retrograde, and relief operations are applicable to other tactical operations.

3-14. Combat in Fortified Areas

a. Offensive. Antitank and antipersonnel mines, contaminants, flame mines, and demolitions are used in an attack on a fortified area to isolate the area; protect the flanks; and impede enemy relief, reinforcement, or counterattack, particularly during the reorganization phase, when the attacking force is the most vulnerable.

b. Defensive. A deliberately planned fortified area makes the greatest possible use of barriers constructed to force the attacker to breach them before reaching his objective. Antitank, and antipersonnel minefields; barbed wire entanglements; antitank ditches; and log, post, and concrete antitank obstacles are organized in depth in the barrier system to force the attacker to dissipate his strength against them.

3-15. Combat in Built-up Areas

a. Offensive. Barriers that can be rapidly constructed are employed outside a city to assist in isolating the area, to protect against counterattack, and to impede enemy efforts to reinforce or withdraw. Mines and demolitions are the obstacles that can be most rapidly constructed and can affort some protection.

b. Defensive. A built-up area may be an obstacle since it canalizes and impedes the attack. Likely avenues of approach are blocked by obstacles and covered with fire. Antitank, antipersonnel, chemical, and flame mines reinforced with wire entanglements hold the attacker under fire while he attempts to breach them. Tank obstacles are improvised throughout the city by blowing craters, demolishing walls, derailing or overturning street or railroad cars, and making maximum use of rubble and debris from demolished buildings. Mining and boobytrapping of the obstacles, particularly those of rubble and debris, are highly effective deterrents to breaching operations.

3-16. Operations at River Lines

a. Offensive. In a river-crossing operation, the attacker is vulnerable to counterattack during the successive periods of reorganization. To reduce this vulnerability, barriers consisting of simple, quickly erected, artificial obstacles (log obstacles, minefields, and demolitions) are used to supplement or reinforce natural obstacles and to block avenues of approach into the bridgehead. These obstacles

are covered with fire by the assault troops on the far bank, supplemented initially with fires from supporting weapons on the near bank.

b. Defensive. A wide, unfordable river is a formidable obstacle, but its natural characteristics can and should be strengthened or improved as time permits. River obstacles are improved through the use of minefields, barbed wire entanglements, and chemical contamination. The enemy is denied the use of likely bridge- and assault-crossing sites, as well as areas suitable for airborne or airmobile landings. Avenues of approach to the river line and possible assembly areas are contaminated or mined, or both. On the near bank, barriers and obstacles are constructed to isolate and destroy any enemy elements that cross the river.

3–17. Combat in Extreme Terrain and Weather Conditions

a. Combat in Woods.

(1) *Offensive.* Woods are an obstacle to mobility since vehicular movement generally is canalized along roads and trails. Obstacles are employed for the same purposes as they are in the attack of a fortified position.

(2) *Defensive.* Barriers strengthen the obstacle value of woods and are placed both outside and inside the wooded area to delay the advance of the enemy so that better use of supporting fires can be made. Mines, abatis, log cribs, posts, hurdles, and road craters are used to block roads, trails, and firebreaks and prevent the movement of vehicles. Booby-trapped mines and barbed wire entanglements are effective in slowing the attack, particularly when antipersonnel mines are employed. Chemical contaminants are also effective in wooded areas. In some situations it may be advisable to create a forest fire for use as an obstacle.

b. Jungle Operations.

(1) *Offensive.* Jungles are usually formidable barriers. During offensive operations, the attacker is vulnerable to counterattack or ambush on his flanks and rear. Security elements should make maximum use of mines, abatis, demolitions, and warning devices to help protect these vulnerable areas.

(2) *Defensive.* In the defense, the natural obstacle of the jungle serves to canalize and direct the attacker along existing trails and roads that are blocked with demolitions, mines, barbed wire, and expedient obstacles (FM 31–30).

c. Desert Operations. In the desert, few obstacles to foot movement exist, and vehicular movement is subject only to the limitations of high temperatures, salt marshes, rocky and boulder-strewn areas, soft silty sand patches, and steep sandy slopes. In general, however, conditions favor vehicular mobility. Opposing forces seldom engage in close-in, fixed-position combat. Minefields generally are the most effective artificial obstacles. Because of the general lack of natural obstacles, combat service support facilities must provide large quantities of materials for the construction of barriers.

d. Mountain Operations. Mountain warfare is characterized by the difficulties which terrain offers to movement. Key features are limited lines of communications and passes that permit movement through the mountains. Barriers are used to prevent the enemy from using mountain routes that would permit him to strike friendly lines of communications from the flank. (Demolitions (conventional or atomic demolition munitions), contaminants, rockslides, and mines are employed to deny or restrict the use of passes and defiles for an extended time. Contamination and recontamination of defiles on the enemy's main lines of communications are used to isolate the area and to slow supply and the movement of reserves or reinforcements. The movement of trained enemy mountain troops around the flanks of prepared defensive areas is blocked by antipersonnel mines, flame mines, and barbed wire entanglements.)

e. Operations in Deep Snow and Extreme Cold. Areas of deep snow and extreme cold contain sparse settlements, few roads, numerous lakes and waterways, and large forested areas. The deep snow and ice and forested areas, which in themselves impede cross-country movement, influence the development of barriers since movement is generally confined to available roads, frozen lakes, and

waterways. Blocking these routes tends to force movement through the heavily forested areas and the deep snow and ice areas. Persistent chemical agents may be employed effectively in these areas, although they have certain limitations. The employment of barriers is similar to that in other types of operations, subject to the limitations imposed by the weather and terrain.

Section VII. STABILITY OPERATIONS

3–18. Definition

Stability operations are that portion of internal defense provided by the Army to maintain, restore, or establish a climate of order within which a responsible government can function effectively and without which progress cannot be achieved. Internal defense and internal development refer to the overall national program to defeat insurgency. Stability operations refer to the military portion of the overall national program.

3–19. Denial Operations

a. In a stability operations environment, the general objectives of denial operations remain the same as in other operations. The selection of specific denial targets, however, is based on the insurgents' vulnerabilities and sophistication. Emphasis in stability operations is on denial through security and control, rather than on destruction or contamination. The use of denial measures in densely populated areas must be carefully planned to insure that they do not produce serious adverse effects on the overall U.S. and host governments internal defense and internal development efforts.

b. Common denial targets in stability operations include the following:

(1) *Border areas.* Obstacles are used within border areas to deny insurgent elements the benefit of sanctuary across international boundaries and support from an external sponsoring power. FM 31–16, FM 31–20, FM 31–21, and FM 31–23 contain detailed discussions.

(2) *Commodities.* In accordance with internal defense and internal development plans, insurgents are denied access to basic necessities, such as foodstuffs, medicines, or weapons.

(3) *Personnel.* Insurgents are denied access to the civilian populace, which they use as a source of supplies, intelligence, and recruits.

(4) *Base areas.* Insurgents are denied access to and use of base areas, such as tunnel complexes and fortified secret installations in regions that are not controlled by friendly forces.

3–20. Employment of Barriers

a. The general principles for the employment of barriers are applicable in stability operations. Barriers are especially useful in border security/anti-infiltration operations.

b. An effective border security system must accomplish three related functions: delay, detection, and destruction. Barriers are used primarily to delay the enemy. Series of obstacles such as mines, to include chemical mines, bobbytraps, barbed steel tape, and flame field expedients are coordinated into anti-infiltration barriers. These barriers delay the movement of infiltrators across the area under surveillance, and cause them to commit acts that will lead to their detection. During the delay firepower can be brought to bear or intercept elements can intercept and destroy the infiltrators. Barriers are also used to canalize infiltrators into ambush points.

c. The tactical use of barriers in stability operations is less common unless the insurgents have sufficient strength to conduct conventional ground operations against friendly forces. Barriers are used principally in the development of the defense for base areas. The defense of base areas is established to provide all-round security for the base with a minimum expenditure of available forces. It is characterized by detailed planning and centralized control. Terrain features, some of them obstacles in themselves (e.g., canals and streams) can be used with other obstacles to make the defense more effective. Mines, boobytraps, and barbed steel tape obstacles can be used along with detection devices in the forward defense area. All obstacles must be covered by observation and fire to be effective.

CHAPTER 4
SPECIAL OPERATIONS

Section I. GENERAL

4-1. Introduction
Special operations as described in this manual are those types of military operations that require specialized troops, equipment, or techniques, such as airborne, airmobile, amphibious, and riverine operations. This chapter discusses the employment of denial operations and barriers in support of those combat operations that require significant numbers of aircraft, seacraft, or rivercraft to move combat power to and within a battle area in both offensive and defensive operations.

4-2. Employment in Special Operations
The success of forces employed in special combat operations can be enhanced by the denial of key areas, installations, and facilities and by the use of barriers. Conversely, airborne and airmobile operations and amphibious raids can be used to execute denial operations in territory controlled by the enemy.

Section II. AIRBORNE OPERATIONS

4-3. General
Airborne operations involve the movement and delivery by air of combat forces and their combat support and combat service support into an objective area for the execution of either a tactical or strategic mission. FM 57-1 and FM 61-100 contain detailed discussions of airborne operations.

4-4. Denial Operations
Airborne forces may execute denial operations by securing bridges, communications centers, or other important objectives to deny their use to the enemy. Airborne forces may also conduct raids to damage or destroy industrial and military installations.

4-5. Employment of Barriers
a. In the assault phase of an airborne operation the airborne force initially concentrates on securing objectives that will insure the security of the force during landing and reorganization. During the assault, the airborne force is extremely vulnerable to attack by enemy mechanized and armor units. To prevent these units from penetrating the airhead and disrupting the landing and reorganization, the airborne force concentrates on blocking likely avenues of approach to the airhead by constructing roadblocks and other hasty obstacles. Units assigned reconnaissance and security missions forward of the airhead will establish similar hasty obstacles in depth blocking the high-speed approaches leading to the airhead. All of these hasty obstacles are a part of the overall barrier plan and will later be strengthened, extended, and integrated into the barrier system.

b. In defending the airhead, the airborne force will organize strong points on key terrain dominating the likely avenues of approach into the airhead. Areas between the occupied positions will be denied to the enemy by using a combination of barriers, and fires. Since the airborne force is particularly vulnerable to attack by armored and mechanized units, the airborne force will construct antitank obstacles, such as minefields, tank traps, and craters, as rapidly as possible. In the employment of barriers, emphasis is placed on—

(1) Use of artificial obstacles to strengthen natural obstacles along the airhead line.

(2) Use of all obstacles, in conjunction with preplanned nuclear fires, to canalize or delay the enemy and cause him to present remunerative targets.

c. To ease the logistic burden inherent in airborne operations, maximum use must be made of locally available materials for obstacle construction. The use of aerially delivered antitank mines reduces the quantity of barrier materials that must be delivered into the airhead.

Section III. AIRMOBILE OPERATIONS

4–6. General

Airmobile operations are tactical operations in which combat forces and their equipment move about the battlefield in air vehicles under the control of a ground force commander to engage in ground combat. FM 57–35 contains a detailed discussion of airmobile operations.

4–7. Denial Operations

a. The most common type of denial operations performed by airmobile forces is the destruction of fortifications, tunnels, and related facilities in the objective area to prevent their further use.

b. Airmobile forces can carry out denial operations by conducting raids for the purposes described in paragraph 4–4 on airborne operations.

4–8. Employment of Barriers

a. Airmobile operations involving the retention of an objective area normally have a defensive phase. Barriers are employed primarily during the defensive phase and are an integral part of the defense. They are used to delay, limit, disrupt, or canalize the enemy's forward movement and to increase his vulnerability to defensive fires and counter-offensive action.

b. In the objective area, the airmobile force, like the airborne force, is vulnerable to attack by enemy armor. See paragraph 4–5*b* for details on the use of barriers to counter the armor threat.

Section IV. AMPHIBIOUS OPERATIONS

4–9. Offensive

In amphibious operations, consideration should be given to the use of contaminants and aerially delivered mines, in addition to fire support, to isolate the beachhead immediately prior to and during the assault. When the beachhead is secured, minefields and demolitions can supplement or reinforce available natural obstacles and block enemy avenues of approach into the beachhead. FM 31–12 contains a detailed discussion of amphibious operations.

4–10. Defensive

To obstruct and deny likely landing beaches in a defense against an amphibious operation, underwater obstacles and mines are used, in addition to the normal organizations of the ground. Exits from the beach and avenues of approach inland are blocked with demolitions and mines. Landing areas suitable for airborne and airmobile troops are mined and strewn with other obstacles and obstructions. Through coordination with the Navy, naval mines may be used in coastal waters adjacent to the beaches.

Section V. RIVERINE OPERATIONS

4–11. General

Riverine operations are all military activities designed to achieve and/or maintain control of a riverine area by destroying hostile forces and restricting or eliminating hostile activities. Operations are characterized by the extensive use of water transport to move military forces and equipment. FM 31–75 (Test) contains a detailed discussion of rivering operations.

4–12. Denial Operations

a. In riverine operations the primary denial measure is to restrict the enemy's use of the extensive network of rivers, canals, and irrigation ditches and scarce land base areas. The limited use of barriers and the extensive use of individual obstacles throughout the riverine area assist in accomplishing the denial mission. Obstacles and boobytraps are used to deny the enemy the use of roads, trails, river/canal banks, and fords.

b. The restriction of the enemy's supply of food and potable water, is a particularly effective denial measure in riverine operations.

4–13. Employment of Barriers

Barriers are not used extensively in riverine operations. They are used primarily in the defense of floating and land bases that may be established in the riverine area. The principles that apply to defensive barriers in general apply to barriers in the riverine area.

CHAPTER 5
OBSTACLES AND DENIAL TARGETS

Section I. GENERAL

5-1. Obstacle Characteristics and Effects

a. An obstacle is any obstruction that stops, delays, or diverts movement. Obstacles may be natural: deserts, mountains, steep slopes, rivers, streams, gullies, swamps, heavy woods, jungle, deep snow, and such manmade features as cities, towns, embankments, and canals; or they may be artificial: demolished bridges, road craters, abatis, artificially flooded areas, minefields, contaminated areas, barbed wire entanglements, antitank ditches, and log, steel, and concrete structures. The quantity and types of artificial obstacles constructed are limited only by the time, labor, material, transportation, and equipment available, and the imagination and ingenuity of the constructing unit. The nature of the principal enemy threat —infantry, armor, mechanized, airborne, airmobile, amphibious, or any combination thereof—determines the character of the obstacles organized into a barrier. Integrated obstacles designed to impede both armor and infantry are more effective than either antimechanized or antipersonnel obstacles employed separately.

b. To be effective, obstacles should be—

(1) Covered by fire or kept under surveillance so that fires and mobile forces can be shifted either to counter enemy efforts to breach the obstacles or to destroy the enemy while entrapped. When it is necessary to cover obstacles with indirect fires, airbursts should be employed since ground impact bursts may destroy the effectiveness of the obstacles.

(2) Sited to take full advantage of natural and other artificial obstacles to keep logistic and construction requirements to a minimum. An obstacle system should be as difficult to bypass as it is to breach, except when the obstacle is intended to divert or deflect the enemy rather than to delay or stop him.

(3) Employed in depth. Obstacles do not seriously hamper the enemy's movement until they overload or heavily tax his breaching capabilities. It is usually prohibitive in time and materials to construct a large deep area of continuous obstacles. The same end is accomplished by constructing successive lines of obstacles, one behind the other, as time and conditions permit.

(4) Camouflaged or employed in a way to surprise the enemy. The defender has the advantage of the enemy's first reaction which is usually confusion, and the enemy may be caught without the men and material to breach the obstacle.

(5) Of no advantage to the enemy. Enemy forces may use certain obstacles to an advantage as they are breached or assaulted. Barbed wire, mines, and boobytraps should be used extensively to deny the enemy the use of any cover or concealment that might be provided by the obstacles.

5-2. Characteristics of Denial Targets

a. Denial targets are primarily strategic and are selected to prevent or hinder the enemy's use of areas, facilities, installations, or materials. Denial targets may be dams, highways, factories, radar installations, ports, bridges, airfields, tunnels, canals, potable water, food, important individuals, and items and equipment. The denial of the most critical installations, facilities, and equipment is desirable in both strategic and tactical operations.

b. Any industrial, logistic, or communications system or area can be denied to an enemy; however, there are usually certain vital components of a denial target system that may be attacked to render the entire system inoperative for the desired time. To deny the

enemy the use of a particular system, the various individual facilities, installations, or structures (targets) that serve a special purpose in the system at a particular location must be determined. Targets must be selected with care to insure that they are mutually supporting and that the enemy cannot readily compensate for their removal, neutralization, or destruction.

c. Army units can conduct patrols or raids to accomplish such missions as demolition of denial targets, emplacement of nuisance minefields and capture of key personnel. Artillery fire or tactical air support may be requested to interdict lines of communications or to destroy or neutralize facilities of military significance.

Section II. NATURAL OBSTACLES

5-3. General

The location and characteristics of natural obstacles have a direct relationship on the general plan of operations and the positioning of forces. The desired characteristics of a natural obstacle are ease of conversion into a more effective obstacle with a minimum effort, materials, and time; defilade from enemy observation; location where friendly observation and defensive fires can prevent enemy breaching; and difficulty of bypassing. Several major types of natural obstacles are discussed separately below. Since obstacles seldom occur separately, the combined effects of two or more must be considered. The most effective natural obstacles against tanks are steep slopes, swamps and nontrafficable soil, and broad, deep streams. Although not discussed specifically below, rice paddies, lava fields, and areas characterized by sinks, subterranean watercourses, and caverns can be formidable obstacles. Their omission is not intended to depreciate their significance. FM 30-10 contains a complete discussion of terrain.

5-4. Steep Slopes

Varying degrees of incline are required to stop different types of vehicles. Tanks can negotiate slopes as steep as 60 percent. Trees, unfavorable soil conditions, large rocks, boulders, and other natural features that do not hinder movement appreciably on level ground can make a less than 60 percent slope impassable. The mobility of infantry is also adversely affected by steep slopes since movement is slower and the troops tire more rapidly (fig. 5-1). The use of road craters, mines, abatis, and artificially induced landslides increases the obstacle value of slopes.

5-5. Escarpments

Escarpments over 1½ meters high are a formidable obstacle to both vehicles and personnel.

5-6. Ravines, Gullies, and Ditches

Generally, ravines, gullies, and ditches are obstacles to wheeled vehicles. When over 5 meters wide, such obstacles are usually effective against tracked vehicles.

5-7. Rivers, Streams, and Canals

The major obstacle value of rivers, streams, and canals is that they must be crossed by special means: deepwater fording, surface, or aerial. The ease of crossing by deepwater fording and surface means is determined by the width, depth, velocity, and bank and bottom conditions. A river over 150 meters wide and over 1½ meters deep is a major obstacle; however, the presence of bridges and fords limits its obstacle value. The first step in increasing the obstacle value of rivers, streams, and canals is the destruction of all bridges. Approach roads and fords are cratered and mined, ferry slips and boats are destroyed, and, as time permits, other artificial obstacles are emplaced in the stream and on both banks. Even after the enemy has ferries and bridges in operation, his movement is canalized, making him vulnerable to artillery or air attack. The obstacle value of fordable rivers, streams, and canals should not be overlooked. The character of their banks and bottoms affects fording operations. Often a ford may be negotiated with little difficulty by the first few vehicles, but the remainder cannot cross because the trafficability of the bottom or entrance and exit slopes has been destroyed.

Figure 5–1. Steep slopes and mountainous terrain are obstacles to wheeled and tracked vehicles. Snow and ice increase their obstacle value.

During floods, rivers and streams are major obstacles and can cause conditions that will extend the obstacle effect for a considerable period particularly by damaging temporary and expedient bridges and deepening the original channel of the river or stream.

5–8. Lakes

Lakes are usually unfordable and unbridged and must be bypassed. Since lakes can be crossed by amphibious vehicles or boats, beach and underwater obstacles are used to increase their obstacle value. When lakes are frozen, they may be less effective obstacles.

5–9. Swamps and Marshes

Swamps and marshes severely restrict mobility and force the canalization of vehicular movement onto causeways, making such movement vulnerable to air or artillery attack. Swamps and marshes over 1 meter deep may be more effective obstacles than rivers, since causeways are usually more difficult to construct than bridges. Most swamps and marshes can be crossed by foot troops, but the physical effort tires men rapidly (fig. 5–2). All roads and causeways through swamps and marshes should be extensively cratered and mined. If the swamp or marsh is wooded, roads and causeways should be blocked by abatis.

5–10. Forests

Temperate Zone forests tend to canalize movement since the roads, trails, and firebreaks through them provide the only means for rapid movement. Tree size and density, soil condition, slope, and depth contribute to the obstacle value of a forest. Forests with trees 20 centimeters in diameter are tank obstacles,

Figure 5-2. Swamps and marshes slow and stop the movement of troops and ground vehicles.

provided the individual trees are sufficiently close to prohibit movement between them; however, in most wooded areas, individual trees of this size are seldom so close. Closely spaced tree of relatively small diameter may be felled to create a mass of vegetation sufficient to stop a tank. On slopes of 20 percent and greater, trees as small as 10 centimeters in diameter will slow and may stop tanks. Tree stumps 45 centimeters high are obstacles to tank movement. Seldom is undergrowth in Temperate Zone forests dense enough to impede seriously the movement of infantry; however, foot movements may be slowed by steep slopes, adverse soil conditions, and fallen trees and branches.

5–11. Jungles

Tropical jungles are significant obstacles to the movement of vehicles and personnel. The ground between the trees is usually covered by interwoven vines, bushes, plants, or rotting vegetation; and in flat land, jungles are swampy or marshy. Visibility is limited because of tangled undergrowth or the lack of light caused by overhead tree foliage. Routes of communications usually are meager or nonexistent. Trails are usually narrow and poorly constructed, becoming untrafficable under continued vehicular use. Rivers and streams have few bridges. Vehicles cannot operate satisfactorily unless routes have been previously prepared. Foot troops move with difficulty because the dense undergrowth frequently requires them to cut their own trails. Since the jungle is in itself an effective obstacle to movement, it is usually necessary only to block the roads and trails and nuisance mine the fords. Also, since streams and rivers often provide the best routes in jungles, antiboat obstacles can be used successfully.

5–12. Deep Snow

Deep snow (that which is over 1 meter deep) is a problem primarily in the Arctic and the northernmost regions of the Temperate Zone, but it can also exist in mountainous regions and other areas that are subject to severe winters. Deep snow is not always a permanent feature of the terrain but is a seasonal obstacle. It is often accompanied by ice and intense cold. These conditions combine to provide an obstacle of major significance, one that impedes the movement of both foot troops and vehicles. Deep snow blankets many terrain features, hiding boulders, rocky areas, ditches, small streams, and fallen trees, which, combined with the snow, effectively hamper the movement of vehicles.

5–13. Deserts

Deserts are not obstacles in the sense that they seriously obstruct physical movement of military forces. Their obstacle value lies in the fact that vehicles must be specially equipped and drivers specially trained for desert operations.

5–14. Mountains

The major obstacle value of mountains is in the compartmentalization of military operations that they cause. The effectiveness of mountains as obstacles can be increased by the use of atomic demolition munitions to block mountain passes and explosives to crater the narrow roads and trails. Frequent rockslides and avalanches in the mountains are also obstacles. Minor obstacles in mountains include stream embankments, valley terraces and benches, spurs, talus, debris-choked valleys, and boulder- and tree-covered slopes and uplands.

5–15. Built-up Areas

The obstacle value of a built-up area depends on its size, location, and construction. Large cities and towns that have many masonry buildings and that are located astride principal communication routes can become obstacles of considerable importance because they can be reduced to rubble and thereby restrict enemy movement. Even if gaps are cleared through the rubble and debris, movement is still canalized. The natural obstacle value of built-up areas can be increased by cratering the streets, demolishing walls, overturning or derailing street or railroad cars, and constructing roadblocks from steel rails, beams, and rubble. When reinforced with mines and barbed wire, such obstacles protect against armored, mechanized, and foot troops.

Section III. ARTIFICIAL OBSTACLES

5-16. General

a. Major types of artificial obstacles are discussed separately below, however, they are normally used with natural obstacles and in combinations of two or more types of artificial obstacles. A variety of artificial obstacles is used in barriers to improve effectiveness and to aid in surprise and deception. Time, labor, materials, transportation, and equipment may limit the number of artificial obstacles that can be employed in the forward portions of the combat zone. Installation time and labor are usually the two most important factors governing the types and numbers of artificial obstacles constructed; therefore, the types employed are limited to those that can be completed quickly and that contribute most directly to the strength of the defense area. The use of mines may be limited by the need to avoid restricting friendly tactical mobility and by the lack of time for installation, the shortage of labor, and the large burden placed on combat service support activities.

b. Artificial obstacles employed in the forward portion of the combat zone consist, for the most part, of demolitions, hasty minefields of limited density, barbed wire entanglements around defense areas, improvised roadblocks, tree blowdown, and some nuisance mining. The more obstacles the commander constructs, the less freedom he has in selecting the time and place for employment of his reserve. This may be remedied by carefully planning gaps and lanes in the barriers and by carefully coordinating the barrier plan with other tactical plans.

c. In rear barriers directed by corps and field army and constructed by corps and field army units, all types of artificial obstacles are employed extensively, including minefields of great density.

d. FM 5–15 and FM 3–10 contain discussions of artificial obstacles, other than mines and demolitions.

5-17. Mines and Minefields

a. General. Mines are among the best types of artificial obstacles—they delay and canalize enemy movement, lower the enemy's will to fight, and cause fear of sudden and unexpected casualties They can be installed with relative ease and speed and can be used to support all types of combat operations. Minefields assist materially in security, defensive, retrograde, and offensive operations by reducing the mobility of the enemy.

b. Classification. Mines are classified as either antipersonnel or antitank. Minefields are often designated as antipersonnel, antitank, or mixed. An antipersonnel minefield is laid primarily for protection against infantry attack and contains antipersonnel mines only. An antitank minefield is designed primarily for protection against armor attack and contains antitank mines, as well as a low ratio of antipersonnel mines. A mixed minefield is laid for protection against both infantry and armor attack. It contains both antitank and antipersonnel mines in considerable density. Mixed minefields are the most commonly employed. Minefields are classified, in addition to type of mine, according to the function they perform, i e., protective, defensive barrier, nuisance, and phony. FM 20–32 contains a complete discussion of mines and minefields.

c. Mine Warfare Policy. Mine warfare policy at each command echelon must be consistent with the overall concept of operations, probable future missions, and available resources. Commanders must guard against the indiscriminate use of mines and minefields by subordinate units. To limit the employment of mines by subordinate units, commanders may restrict or revoke the authority needed to employ mines and minefields. Restrictions guard against extensive mine warfare without the knowledge and consent of the commander responsible for large-scale maneuver. Failure to provide the subordinate commander with proper guidance, to include necessary restrictions, may jeopardize future operations and place an undue burden on combat service support activities. Unless cogent reasons for restrictions exist, subordinate commanders normally are permitted to use mines and minefields within their available resources to economize on forces, strengthen defense areas, and delay or disrupt enemy movement.

d. Methods of Employment. There are two

methods of laying and installing minefields—deliberate and hasty. Deliberate minefields support major tactical operations when time is available to obtain the large number of mines required and to coordinate the siting of minefields with all units concerned. Deliberate minefields normally conform to a standard pattern, and each mine is concealed by burial. Hasty minefields are normally limited in scope and number of mines employed. Such minefields are usually laid without the assistance of engineers and do not necessarily follow a standard pattern. FM 20-32 contains details of deliberate and hasty installation of minefields.

e. Protective Minefields. A unit employs protective minefields to strengthen its close-in protection. It uses them in both the forward and rear portions of the combat zone and in isolated locations, such as detached posts, outposts, working parties, or roadblock defense parties Antitank, antipersonnel, and flame mines, as well as trip flares, may be used. Generally, protective minefields are laid on short notice, using mines from the unit's basic load or local stocks. The mines must be readily removable by the installing unit. Small nonmetallic mines, antihandling devices, special-type mine fuzes, and boobytrap devices are not used. Protective minefields are laid across the most likely enemy avenues of approach, within small-arms range of the defenders but beyond hand grenade range. Protective minefields must be removed by the installing unit or, if relieved by another unit, the responsibility must be formally transferred to the relieving unit. Unless specifically restricted by higher headquarters, battalion and comparable commanders are authorized to employ protective minefields. This authority cannot be delegated lower than company and comparable commanders. The commander authorizing installation of a protective minefield must consider its effect on other security measures, on normal activities of his unit, and on probable future missions.

f. Defensive Minefield. A defensive minefield is one employed in accordance with a division's plans to defeat or limit penetrations into or between company, battalion, or brigade defense areas; to strengthen or link other obstacles, and to reinforce the defense areas. The location of defensive minefields should be coordinated with division and corps fire support plans. Division and higher commanders are authorized to employ defensive minefields unless specifically restricted by higher headquarters. This authority cannot be delegated lower than brigade and comparable commanders. All types of mines, antihandling devices, and flares may be used, but their use should be carefully considered by weighing the advantages to be gained against possible future disadvantages.

g. Barrier Minefields. A barrier minefield is one employed to block enemy attack formations, especially to the flanks and rear; to canalize the enemy's approach into selected target or battle areas; and to limit or contain deep enemy penetrations or wide envelopments so that supporting fires and maneuver forces can be concentrated and employed against the threats. Barrier minefields are major elements in the defensive operations of a corps or larger unit, and their use is carefully integrated with other tactical plans, including counterattacks or retrograde actions. Their location is coordinated with corps fire support plans, and the minefields are either covered by defensive fires or placed under surveillance so that fires or reserves can be shifted to cover them if the need arises. Barrier minefields are laid in considerable depth and offer maximum resistance to breaching. All types of mines, antihandling devices, and flares are used. Corps and higher commanders are authorized to employ barrier minefields unless specifically restricted by higher headquarters. This authority cannot be delegated lower than division and comparable commanders. Because of the resources required, the use of barrier minefields in the forward portion of the combat zone is limited. They are employed extensively in the rear portion of the combat zone as a part of a corps or field army defense plan.

h. Nuisance Minefields. Nuisance minefields are employed to delay and disorganize the enemy and to hinder his use of an area or route. They must be laid with imagination to produce the desired effects and they are particularly

appropriate in retrograde movements and denial operations. Characteristics of nuisance minefields include the use of special mines, fuzes, and boobytraps; lack of a standard pattern; lack of minefield marking, except as a temporary measure to protect friendly troops; and abbreviated minefield records. Nuisance minefields are an effective means of mining in depth and are employed as a part of a deliberately planned barrier system in retrograde movements. They are employed along major roads, railroads, and avenues of approach, and in areas likely to be used by advancing enemy troops, such as potential artillery positions, bivouac areas, and observation and command post sites. The effectiveness of a demolished bridge, crater, abatis, or other obstacle is materially improved if the site and the surrounding area are seeded with nuisance mines, both antitank and antipersonnel. Such mining hampers the reduction, rebuilding, or repair of the obstacle. Nuisance mines can be used in denial operations to deny facilities of military significance, such as public buildings, warehouse areas, airfields, abandoned military supplies, and important railway installations. Nuisance minefields are more accurately described as "nuisance mining." Because of the hazard to friendly troops and the restrictions placed on maneuver, the use of nuisance minefields is coordinated with tactical plans of higher headquarters. A high percentage of the antitank mines used in a nuisance minefield should be equipped with antihandling devices; and, when possible, nonmetallic antipersonnel mines should be used. Normally, nuisance minefields should be well concealed for maximum effectiveness and should be difficult to remove; however, if the threat of mines in itself delays the enemy, the need for uniformly careful concealment is somewhat less. Field army and higher commanders are authorized to employ nuisance minefields unless specifically restricted by higher headquarters. This authority cannot be delegated lower than division and comparable commanders.

i. Phony Minefields. Phony minefields simulating live minefields are normally not used until the enemy is sufficiently mine conscious to stop and investigate suspected minefields. They are used when time, effort, or material do not permit laying a live minefield, when gaps are required by the tactical plan within or between existing minefields, or when necessary to economize on mines and installation effort. To be effective, a phony minefield must resemble an actual minefield and have the same fire coverage and marking. Phony minefields can be used by any commander who has authority to employ the type of live minefield simulated.

j. Boobytraps. A boobytrap is an explosive charge or other device that explodes when an unsuspecting person disturbs an apparently harmless object or performs a presumably safe act. A "dirty trick" device is a manufactured boobytrap designed to imitate some useful article that appeals to an individual's desire for possession. Boobytraps and dirty trick devices create uncertainty and suspicion, cause confusion, inflict casualties, destroy material, and lower the morale of enemy forces. Boobytraps and dirty trick devices can be used effectively during retrograde operations in much the same manner as nuisance mines. In the defense, boobytraps and dirty trick devices can be located forward of the forward edge of the battle area on avenues of approach to impede enemy progress, delay neutralization of other obstacles, and give warning of enemy approach. Theater commanders prescribe policies for the use of boobytraps and dirty trick devices. Unless specifically prohibited from doing so, field army commanders are authorized to employ them. This authority cannot be delegated lower than division and comparable commanders. Boobytraps and dirty trick devices are reported and recorded as nuisance minefields (*l* below). FM 5–31 contains details of their employment.

k. Mines Laid Behind Enemy Positions. Mines can be laid behind enemy positions by friendly guerrilla forces, raiding forces, or aircraft. Unless self-neutralizing, such mines constitute a threat to future operations; therefore, their use is coordinated with operation plans. Authority to lay mines in rear of enemy positions is the same as for nuisance mines. When employed, they are reported and recorded as nuisance minefields.

l. Minefield Reports and Records. Mine warfare can be conducted with minimum hindrance to tactical flexibility by enforcing the reporting and recording of minefields. Reports on all minefields are forwarded to the next higher headquarters to inform all commanders of mine warfare actions that might affect their tactical plans. Written minefield records are prepared simultaneously with mine installation and, except for protective minefields, are forwarded to field army level. Records on protective minefields are forwarded to division or comparable level. The maintenance of minefield reports and records and the dissemination of current information are responsibilities of each headquarters. Reports and records are retained until the minefields are removed. FM 20–32 contains procedures for reporting and recording all minefields, including nuisance minefields.

5–18. Barbed Wire Entanglements

a. General. Barbed wire entanglements can be either fixed or portable and are simple, effective, and flexible antipersonnel obstacles. They are used, in some instances, to impede the movement of vehicles.

b. Classification. Barbed wire entanglements are classified according to depth (belts, bands, and zones) and use (tactical, protective, and supplementary). A belt is a single entanglement in depth; a band is two or more belts in depth without interval; and a zone is two or more bands or belts in depth, with an interval between each. Tactical barbed wire entanglements are those sited along the friendly side of final protective lines to break up enemy attack formations or to divert enemy forces into areas covered by intensive weapon fire. Such entanglements extend across the entire front of a battle area, but they are not necessarily continuous. Protective wire entanglements are those sited to prevent surprise enemy assaults from close-in points; they are located sufficiently close for day and night observation but far enough away to keep the enemy beyond hand grenade range. Protective wire entanglements are erected around rear area installations in the same manner and for the same purposes as protective wire in forward areas. Supplementary wire entanglements are those sited to conceal the exact traces of the tactical wire and the final protective line, as well as to connect platoon and company battle areas.

c. Siting and Layout. To be effective, barbed wire entanglements are sited and laid out to meet the following requirements:

(1) Under friendly observation, covered by fire, and, when practicable, protected by antipersonnel mines, flame mines, trip flares, and warning devices.

(2) Concealed from enemy observation by incorporating such terrain features as reverse slopes, hedges, woods, paths, and fence lines.

(3) Erected in irregular and nongeometrical traces.

(4) Employed in bands or zones whenever practicable.

(5) Coordinated with other elements of the defense.

d. Design, Construction, and Employment. FM 5–15 and FM 5–34 contain details of design, construction, and employment of barbed wire entanglements.

5–19. Demolition Obstacles

a. General. Demolition is the destruction of structures, facilities, or materiel by fire, water, mechanical means, weapons fire, aerial bombing, nuclear devices, or hand-placed explosives. A demolition obstacle is one that is created either by demolishing a structure or by creating an obstruction where none existed. Demolition obstacles may be used with other artificial obstacles to strengthen natural obstacles, such as the blocking of roads and trails through wooded areas with abatis. Except for hard targets and targets of great size, demolition by hand-placed explosives generally is the most rapid, certain, effective, and economical. Subsequent discussion of demolition obstacles in this paragraph is limited, therefore, to those created by hand-placed explosives. FM 5–25 contains details on employment of hand-placed explosives. For hard targets of great size, such as tunnels, large masonry and concrete bridges, mountain defiles, airfields, port complexes, and similar installations, destruction by nuclear devices is technically preferable to other destruction methods. Demolitions using nuclear devices are

discussed separately because of their special effects and because special authority and special handling are required.

b. Demolition Policy. Because of the military disadvantages and the adverse political, psychological, and economic consequences of overdestruction, field army and higher commanders promulgate demolition policies and issue instructions to prevent excessive destruction. Excessive destruction can impose a tremendous repair mission or create adverse civilian reaction. Either of these effects could seriously hinder future operations and threaten accomplishment of the mission. A sound military reason must exist for all demolitions. Unless the enemy is adversely affected tactically or strategically by a specific demolition, it should not be considered.

c. Site Selection. The selection of demolition obstacle sites or targets is of great importance. When possible, the sites selected are so located that bypassing the resulting obstacle is more difficult and time-consuming than removing, rebuilding, or repairing the destroyed facility. Road craters, for example, are sited where the terrain on either side of the road is untrafficable and detouring is so time-consuming as to be infeasible

d. Execution. Normally, corps and lower commanders order the preparation and demolition of tactical targets. Field army and higher commanders order the preparation and destruction of strategic targets. When a target has both strategic and tactical significance, preparation and destruction may be delegated to the tactical commander responsible for the area. Some targets, however, may be so vital to the plans of higher commanders or the structure itself so important that the commander reserves the destruction to his own order. Such demolitions are called *reserved demolitions* and can include those planned for destruction as part of preliminary operations, as well as those reserved for destruction at the last moment. A demolition firing party, usually engineers, accomplishes demolitions. The demolition firing party is given specific instructions as to who may *authorize* the destruction or advance or delay the destruction, when destruction will be accomplished, action to be taken if the party is threatened with capture, whether the commander of the demolition guard may execute the demolition on his own authority, what unit or units require the use of the facility before demolition, and other pertinent information. These instructions are transmitted to the demolition firing party on DA Form 2050–R, Orders to the Commander, Demolition Firing Party (FM 5–25). If there is danger that the target site may be captured by the enemy, the commander authorized to order destruction provides a demolition guard. Normally, the commander of the demolition guard commands both the demolition guard and the demolition firing party. A tactical commander must choose carefully the method of command and control to execute a reserved demolition. The following methods can be used:

(1) *Direct order of a specific commander.* A direct order from a commander who has, or who has been delegated, the authority to execute a reserved demolition is the most frequent control used. The commander controlling destruction may station a liaison officer with adequate communications at the site. Under such circumstances, the liaison officer receives the demolition execution order from the commander and transmits it to the demolition guard and demolition firing party. This assists in insuring that destruction is keyed to the maneuver of the local tactical commander and is accomplished at the proper time.

(2) *At an exact time and date.* When the tactical situation permits, the appropriate commander may specify an exact time and date for execution of the obstacle. This method is used only when part of the obstacle plan can be accomplished by a timetable.

(3) *On receipt of a preassigned code word.* The appropriate commander may direct the obstacle to be executed by the use of a preassigned code word. On receipt and authentication of the code word, the demolition firing party executes the obstacle.

(4) *As soon as prepared.* In a pressing situation, the appropriate commander may direct the obstacle to be executed as soon as it can be prepared.

(5) *To prevent capture.* The appropriate commander may direct that the obstacle be executed only if necessary to prevent capture by the enemy. This method is used frequently with one of the other methods above.

e. Methods. Deliberate demolition is used when enemy interference during preparation is unlikely and sufficient time is available for thorough reconnaissance and careful preparatory work. This permits economy of means and certainty of execution. Hasty demolition is employed when time is limited and both economy and controlled effect are secondary to speed. In either method, structures are destroyed at their most vulnerable points so that a minimum of effort and material is expended. FM 5–25 contains the details of demolition techniques.

f. Bridge Demolitions. The demolition of bridges constitutes one of the primary artificial obstacles incorporated into barrier systems (fig. 5–3). The complete destruction of a bridge is frequently neither necessary nor justified. The extent of destruction is governed by the length of delay required, the damage necessary to require construction of a new bridge rather than repair of the old one, and the enemy's expedient bridging capability. The strategic or tactical impact of bridge demolitions depends on the width of the water obstacle and its location. Coordination of the destruction of all bridges over a particular water obstacle in a given sector insures elimination of alternative crossings. All existing or possible fording sites that would permit the enemy to bypass the demolished bridges should be cratered or mined.

g. Ferries and Ferry Sites. To complete the

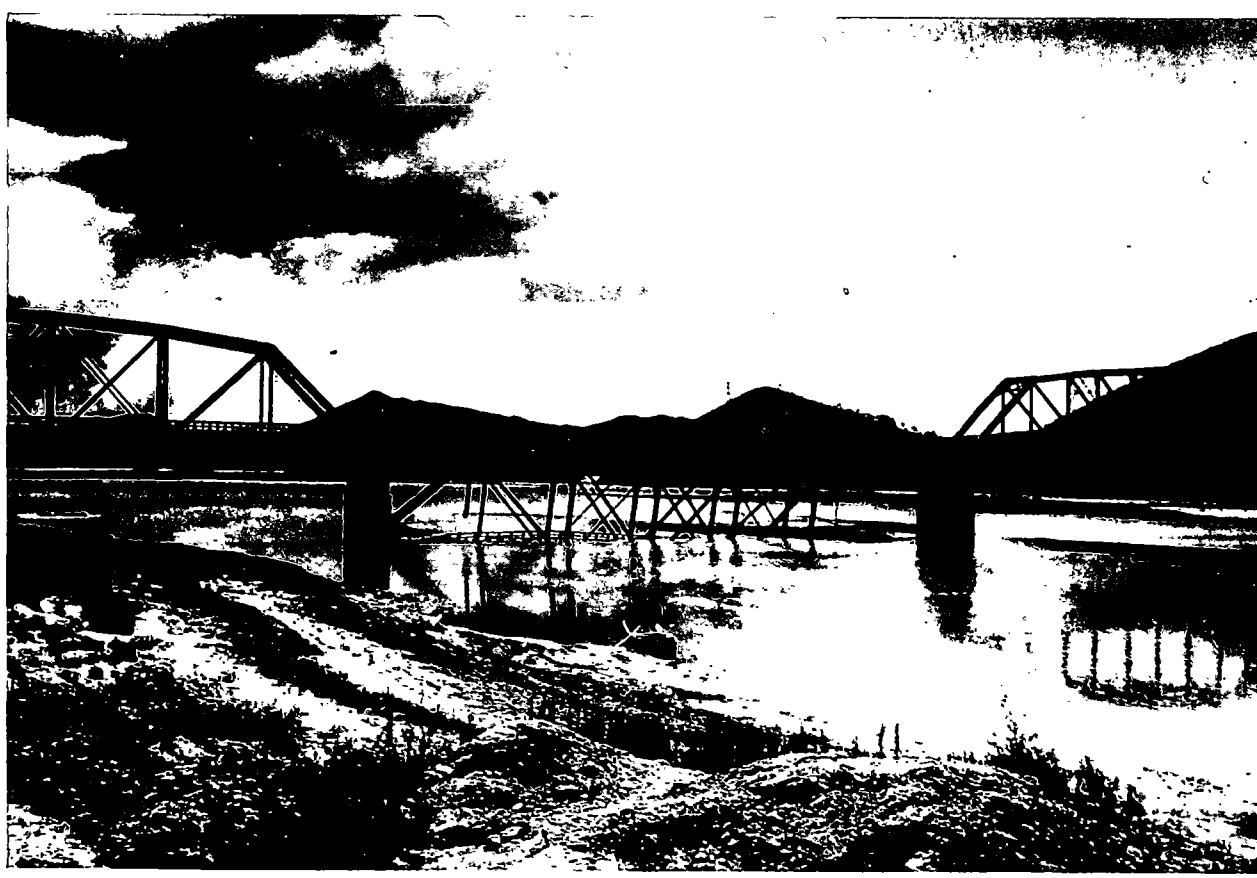


Figure 5–3. Bridge demolitions create obstacles to enemy movement. Complete destruction is frequently neither necessary nor justified.

obstacle effect of a river—in addition to executing bridge demolitions and mining or cratering fords—it is necessary to destroy or seriously damage all ferry facilities, including ferryboats, mechanical devices at the ferry slips, docking facilities, and approaches to the river.

h. Dams and Locks. Dams and locks, particularly large ones, are generally considered to be strategic targets; however, they also have a tactical significance since they often provide a means of crossing an otherwise unfordable river. Unless otherwise specified for strategic reasons, demolition of locks and dams ordinarily is limited to the destruction of watergates, sluices, controls, and any crossings over the river in conjunction with these structures.

i. Craters. Craters are effective obstacles on roads, trails, causeways, or paths, provided they are too wide to be spanned by tracked vehicles and too deep to be traversed by wheeled vehicles, and provided the terrain is such that the crater cannot be easily bypassed. Defiles, steep sidehill cuts, and high embankments are good sites for craters. Explosives may be placed in culverts or in holes dug in the road and detonated when an enemy attack is about to overrun the obstacle.

j. Abatis. When a road, trail, or firebreak passes through heavily wooded areas, abatis are effective obstacles to vehicular movement. They are considered to be demolition obstacles only in the sense that the trees required may be felled by explosives, as well as by handtools (fig. 5–4).

k. Tunnels. Demolition of tunnels using conventional explosives is virtually impossible unless time-consuming and expensive preparations are made. Tunnels are particularly suitable targets for atomic demolition munitions.

l. Masonry Buildings. The demolition of masonry buildings in cities with narrow streets and closely built-up areas creates rubble that restricts and canalizes movement. Cities in which communications routes converge are incorporated into barrier plans making it necessary for the enemy to capture rather than to bypass them.

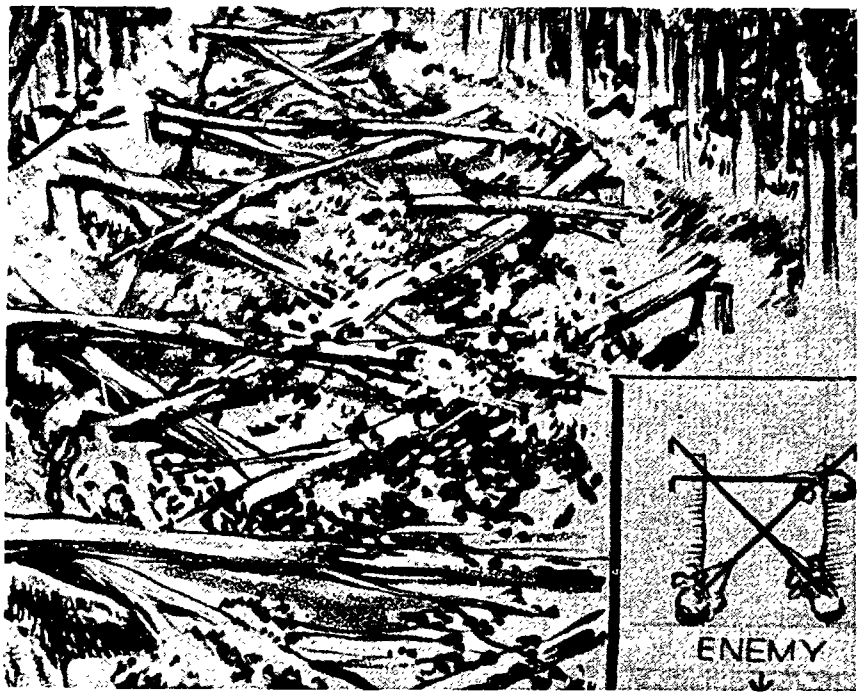


Figure 5–4. An abatis. One of the most effective obstacles to the movement of wheeled and tracked vehicles through wooded areas.

5–20. Artificial Flooding

a. General. The use of water as part of a barrier system generally includes rivers, lakes, drainage and navigation canals, and poorly drained areas. These are natural or manmade fixed features. When it is possible to alter hydrologic characteristics, the obstacle value of a river can be greatly increased (fig. 5–5).

b. Tactical Use of Dam Reservoirs. In a tactical situation, three major effects result from the use of dam reservoirs—

(1) *Destruction.* The flood wave resulting from a large volume of impounded water that has been released almost instantaneously can destroy permanent and temporary bridges, houses, and factories. From a tactical viewpoint, the released water can disrupt the assault, ferrying, and bridging phases of an enemy river-crossing operation.

(2) *Overbank flooding.* If the banks of a river are low and a large quantity of impounded water is released into the river, overbank flooding usually occurs. From a tactical viewpoint, overbank flooding increases the width of the water barrier; washes out installed tactical bridging or makes it unsafe to use; or washes out or floods crossing-site approach roads for a considerable time. Also, saturation of the banks temporarily reduces soil trafficability.

(3) *Threat of release.* Control of a dam reservoir by friendly forces and the inherent threat of suddenly releasing the impounded water into a river can influence the actions of the enemy. In such a situation, the enemy will probably delay crossing the river in force until control of the dam is gained to give some assurance of success in the crossing operation and to prevent isolating assaulting units from the main body and exposing them to defeat.

c. Other Flooding Methods. Artificial flooding can be created by methods other than the release of impounded water. Expedient dams may be used to obstruct a river or stream and thereby create still-water barriers where none previously existed by forming a lake or by flooding low-lying areas that have relatively poor natural drainage. In some instances, flooding can be created by breaching levees and dikes. When artificial means are used to drain an area, muddy, marshy, or swampy conditions can often be re-created by destroying the pumping and drainage facilities. Aqueducts and siphons associated with navigation or drainage canals often can be destroyed and flooding of tactical significance created in adjacent areas.

5–21. Other Obstacles

a. General. In addition to the obstacles previously discussed, numerous others can be used to improve ineffective natural obstacles. This not only reduces the time, labor, materials, transportation, and equipment required but

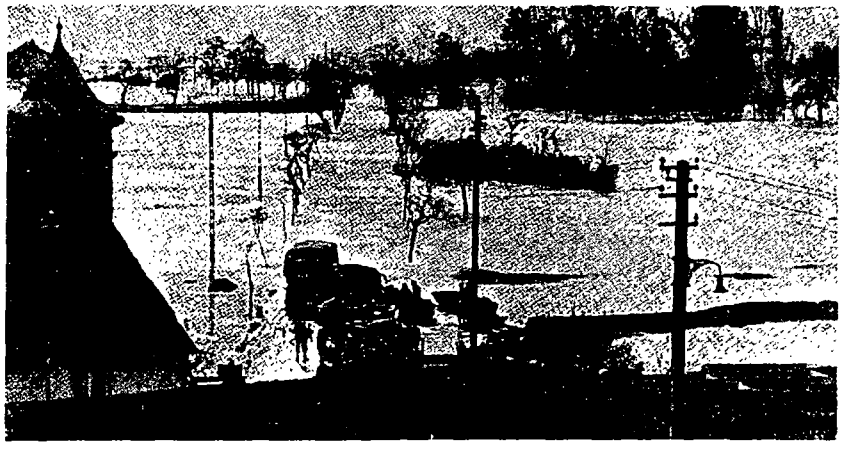


Figure 5–5. Artificial flooding is an excellent means of delay. Cross-country mobility is denied and the enemy confined to hard-surfaced roads for movement.

makes camouflaging and concealing the obstacles easier. FM 5–15 and FM 3–34 contain details of construction and employment of other artificial obstacles.

b. Log Obstacles. In heavily forested areas, many types of effective log obstacles, other than abatis, can be constructed at defiles from available materials. Such obstacles include cribs and hurdles, log posts, and cables tied between trees.

c. Antitank Ditches. In open country devoid of suitable natural obstacles, antitank ditches can be employed; however, they require considerable time and effort. They generally are better suited for use in defensive areas in the rear portion of the combat zone than in the forward portion of the combat zone.

d. Steel Obstacles. Steel beams, ramps, tetrahedra, and hedgehogs are generally built into permanent defensive works. They require considerable resources to fabricate and generally are beyond the capabilities of tactical units. FM 5–15 contains details on steel obstacles.

e. Concrete Obstacles. Concrete obstacles are usually found in permanent defense installations. They require considerable resources to construct and are generally beyond the capabilities of tactical units. FM 5–15 contains details on concrete obstacles.

f. Obstacles to Airborne and Air-Landed Troops. Artificial obstacles that can be placed on suitable landing areas and drop zones include crates, posts, barbed wire, immobilized or parked vehicles, rock-filled oil drums, minefields, armed bombs placed on runways, felled trees, and contaminants. FM 5–15 contains details on obstacles to airborne and air-landed troops.

g. Beach and River Line Obstacles. Enemy landings can be hindered by emplacing mined posts, piles, steel and concrete obstacles, rock cribs, barbed wire, and mines under water and along beaches and riverbanks. Such obstacles force enemy troops to land short of the beach or riverbank and to cross a wide obstacle-studded area. Beach and river line obstacles delay attacking forces in vulnerable landing areas and on the water; permit maximum effective use of defensive weapons; canalize landing craft and personnel into areas of heavy defensive fires; disrupt landing procedures; and cause confusion among landing units. In many cases, these obstacles can be improvised from local materials. FM 5–15 contains details on beach and river line obstacles.

5–22. Atomic Demolition Munitions

a. General. The employment of atomic demolition munitions (ADM) requires a basic understanding of nuclear effects, particularly those resulting from surface and subsurface bursts; response of targets to these effects; the distance at which secondary damage or casualties can be expected; the influence of various environmental conditions; and the variability of predicted results. FM 5–26, FM 101–31–1, and TM 23–200 contain specific guidance on the operational and logistic aspects of ADM employment and details on specific nuclear phenomena.

b. Employment. Normally, the theater commander publishes separate instructions governing the employment of ADM. Based on these, subordinate commands generally publish separate instructions. ADM can destroy targets and accomplish missions that might normally be prohibitive in cost for conventional explosives because of the logistic effort involved. Selection of ADM targets involves the consideration of several factors. Some targets, such as bridges and locks, usually can be quickly and adequately destroyed by conventional explosives; some, such as dams, may be suitable for demolition by either conventional explosives or nuclear weapons. Other targets may require excessive amounts of conventional explosives and emplacement time, such as tunnels and underground installations, or they may require rapid and positive destruction, such as airfields. Targets that require an excessive amount of labor or time for emplacement of conventional explosives because of their size or type of construction are considered to be hard targets and are particularly well suited for the use of ADM. The military significance of a target is evaluated based on the effect that denial of the target will have on the enemy's combat effectiveness. If the re-

duction in the enemy's combat effectiveness is such that a major advantage is gained, the target has high military significance. Targets located in or near large urban areas in friendly territory normally should not be attacked with nuclear weapons; however, the advantages of destroying the target, particularly a hard target, must be weighed against the possible effects on the local population. FM 5–26 and FM 101–31–2 contain details on employment of ADM.

c. ADM Targets.

(1) *Defiles and tunnels.* Defiles and tunnels are frequent ADM targets because they have high military significance, are hard targets, lend themselves to effective blocking, and are seldom located near areas of dense population.

(2) *Bridges.* Bridges are infrequent ADM targets since, with the possible exception of some heavy masonry and concrete structures, they can be sufficiently destroyed by conventional explosives. Complete destruction is seldom required.

(3) *Stream cratering.* The use of ADM for stream cratering is infrequent; however, the great cratering capability of ADM makes possible the diversion of streams to create obstacles where the enemy least expects them. The crater lip can form a temporary dam, create a lake, cause overbank flooding, and produce an effective water barrier.

(4) *Dams and dikes.* Dams and dikes are infrequent ADM targets since a reasonable amount of conventional explosives can normally accomplish the desired destruction.

(5) *Area contamination.* It is possible to employ ADM to create radiologically contaminated areas as a part of a barrier system; however, the requirements for optimum meteorological conditions and the temporary nature of the contamination make the use of ADM for this purpose infrequent. Unless contamination is renewed, the obstacle created is effective for only a few days.

(6) *Airfields.* Airfields are frequent ADM targets since the demolition of an airfield's runway complex is the most effective way to destroy the operational capability of an airfield. In most cases, several ADM will be required for this task.

5–23. Artillery and Aircraft Nuclear Delivery Systems

Artillery or aircraft nuclear delivery systems provide a variety of yields and burst options for destroying demolition targets. Surface and subsurface burst options can cause cratering, tree blowdown, and rubble in cities and towns, as well as a blanket of radioactive contamination. Airburst options can be employed if fallout is not desired. Actual selection of the most suitable delivery system for attack of specific targets is based on target analysis, which considers the many variables involved. As a general rule, however, creating an obstacle using artillery or aircraft delivery systems is much more expensive than creating the same obstacle by ADM's. FM 101–31–1 contains details on the employment of artillery and aircraft delivered nuclear weapons.

5–24. Use of Chemical Agents and Radiological Contamination in Barrier Operations

a. General. A barrier is made more effective when chemical agents, or radiological contamination are used since the enemy is forced to mask, wear protective clothing, decontaminate the barrier, or take other protective measures. FM 3–10, FM 3–10A, FM 3–10B, FM 20–32, FM 20–33, FM 101–31–1, and FM 101–40 contain the tactics and techniques of chemical, biological, and radiological operations.

b. Authority. The initial authority to employ nuclear, biological, and chemical munitions must first be received by the theater commander. The theater commander may delegate this authority to his subordinate commanders, subject to any policy restrictions deemed necessary. After receipt of initial authority, field army commanders are authorized to employ chemical mines in barrier and nuisance minefields. (FM 20–32). This authority cannot be delegated lower than division and comparable commanders. The employment of chemical mines normally is not authorized in protective or defensive minefields unless they are later integrated into a barrier system. After au-

Figure 5–6. Denial of rolling stock assists in disrupting one of the enemy's principal means of transportation.

thority to use NBC agents is received, divisions and higher units normally plan and execute operations involving chemical agents while corps and higher units normally plan and execute operations involving radiological contamination.

c. Chemical Agents. Persistent chemical agent mines or flame mines or flame field expedients are used to kill or disable personnel and to restrict the use of terrain and materiel. Persistent chemical agents can be used with other obstacles to protect the front or flanks, isolate the battle area, delay the enemy during retrograde operations, strengthen the defense, impede enemy counterattack, or isolate a bridgehead. A chemical obstacle, as any other obstacle, must be covered by supporting weapons fire or observation. This action also forces the enemy into closer contact with the contamination. Chemical agent effects are a hazard to friendly troops and to the local population, as well as to the enemy. This is considered when coordinating the use of such chemical agents with the barrier plan and with other operation and combat service support plans. Other types of chemical agents, primarily flame mines or flame field expedients are used for the same purposes as chemical agent mines, as well as for battlefield illumination and for warning of an enemy approach at night. When using flame mines, the possible effect on other obstacle components (such as trip wires, electric detonating wire, and the chemical agents in chemical mines) is considered.

d. Radioactive Contamination. Radioactive contamination can result from radioactive fallout or neutron-induced radioactivity caused by the detonation of a nuclear weapon. The use of radiological contamination to produce casualties or restrict use of an area may be militarily feasible; however, it is seldom practical to employ a nuclear weapon solely to deny the enemy the use of an area by deliberately producing induced radioactivity. Outside the initial effects area, radioactive fallout caused by the surface detonation of a nuclear weapon creates a residual effect which may cover many square miles; this residual effect, however, is temporary.

Section IV. DENIAL TARGETS

5-25. General

The most frequently employed denial targets and methods of destruction are discussed below; however, some of the artificial obstacles that have been previously discussed may also be used in denial operations. For example, nuisance minefields can be employed in denial operations to prevent the enemy's use of abandoned military supplies and facilities that have military significance, such as public buildings, warehouses, airfields, and railway installations.

5-26. Denial Target Systems

a. Areas. Areas may be denied to the enemy, but the short period such denial is effective, combined with the enemy's capability to pass through such areas quickly following withdrawal of the defender, makes area denial essentially a barrier technique rather than a strategic denial measure. Areas can be denied by—

(1) Demolitions that deny access to the area.

(2) Chemical or radiological contamination.

(3) Flooding.

(4) Delayed-action explosives.

(5) Construction of obstacles.

(6) Isolation through interdiction or destruction.

(7) Weapons fire.

(8) Maneuver.

b. Installations and Facilities. For both strategic and tactical reasons, denial of key installations and facilities is desirable in most situations. Selected denial targets are integrated into the overall strategic and tactical concepts of the theater operation plan and are executed in accordance with war objectives.

(1) *Railway system.* Effective denial of the railway system disrupts one of the enemy's principal transportation means. It necessitates

a systematic denial of major structures, facilities, locomotives, and rolling stock that are essential to the system's operation. To deny a rail net, it is necessary to cut all rail lines running generally parallel to the axis of enemy advance. The number of complete cuts required depends on the length of delay desired. The best specific targets are major bridges, tunnels, and defiles. The most important supporting targets are railway terminal facilities, such as roundhouses, shops, and marshaling yards; locomotives; and rolling stock (fig. 5–6). When friendly forces desire to reuse facilities, with a limited rebuilding effort, the railway system may be effectively denied to the enemy by removing or destroying special-type rail sections, such as frogs, switches, or guard rails. TM 5–370 should be used in planning railway denial operations.

(2) *Highway system.* If the railway system is successfully denied, the enemy must depend on other transportation. Highway system denial complements railway system denial and is of considerable significance. It should be noted, however, that restoration of the highway system by replacement or repair of bridges and other structures generally is easier and faster than restoration of the railway system. Denial of the highway system, therefore, is not effective for as long a time as denial of the railway system. Specific targets best suited for denial of a highway system are major bridges, tunnels, and defiles.

(3) *Airway system.* The airway system is highly important to the enemy for tactical and strategic operations as well as for limited combat service support. Other than aircraft (which are evacuated or destroyed), the specific targets are the airfields. Airfields can be denied by cratering the runways and destroying key supporting facilities. ADM are particularly suitable for this mission.

(4) *POL system.* POL system denial includes, in addition to the destruction of bulk POL, the destruction of terminal storage, producing, refining, and dispensing facilities (fig. 5–7), as well as facilities for transporting bulk POL. The amount of destruction required varies depending on the particular area under consideration, since destruction of a single key facility may eliminate the need for other destruction. For example, in an area lacking in oil production but having refineries, the enemy would be unable to use the refineries if all bulk POL handling and storage facilities were destroyed.

(5) *Electric power system.* Denial of major electric power systems impairs the operation of heavy industries. Denial should provide for the systematic destruction of key generating plants. Since transformer stations form the heart of transmission systems, they are usually the most suitable denial targets for disrupting power service with the least effort. The destruction of electric power systems has a considerable impact on the local civilian population, and this factor must also be considered.

(6) *Communications system.* Disruption of major communications systems should provide for the destruction of telephone and telegraph exchanges, repeater stations, and radio stations only. More complete denial has a greater effect on the civilian population than on the enemy military effort.

(7) *Inland waterways system.* In well-developed areas, particularly in Western Europe, inland waterways are highly developed and carry a large part of total freight traffic. The waterways system can be denied by destroying the dams, siphons, aqueducts, embankment or levee walls, locks and gates, barges, and other floating craft, as well as by obstructing the waterways.

(8) *Utilities.* The destruction of water, gas, and sewerage systems ordinarily has little or no military effect on the enemy but has a most harmful effect on the local population. Unless a marked military advantage accrues, such as in the denial of water to the enemy in a desert or riverine area, utility systems should not be impaired.

(9) *Ports.* Ports can be destroyed by nuclear or conventional demolitions; scuttling ships in harbors, across bars, alongside quays, piers, and docks; removing or destroying cranes, lighters, tugs, rail facilities, channel markers, and communications equipment; removing pilots and key navigational personnel; and destroying bulk POL-handling equipment.

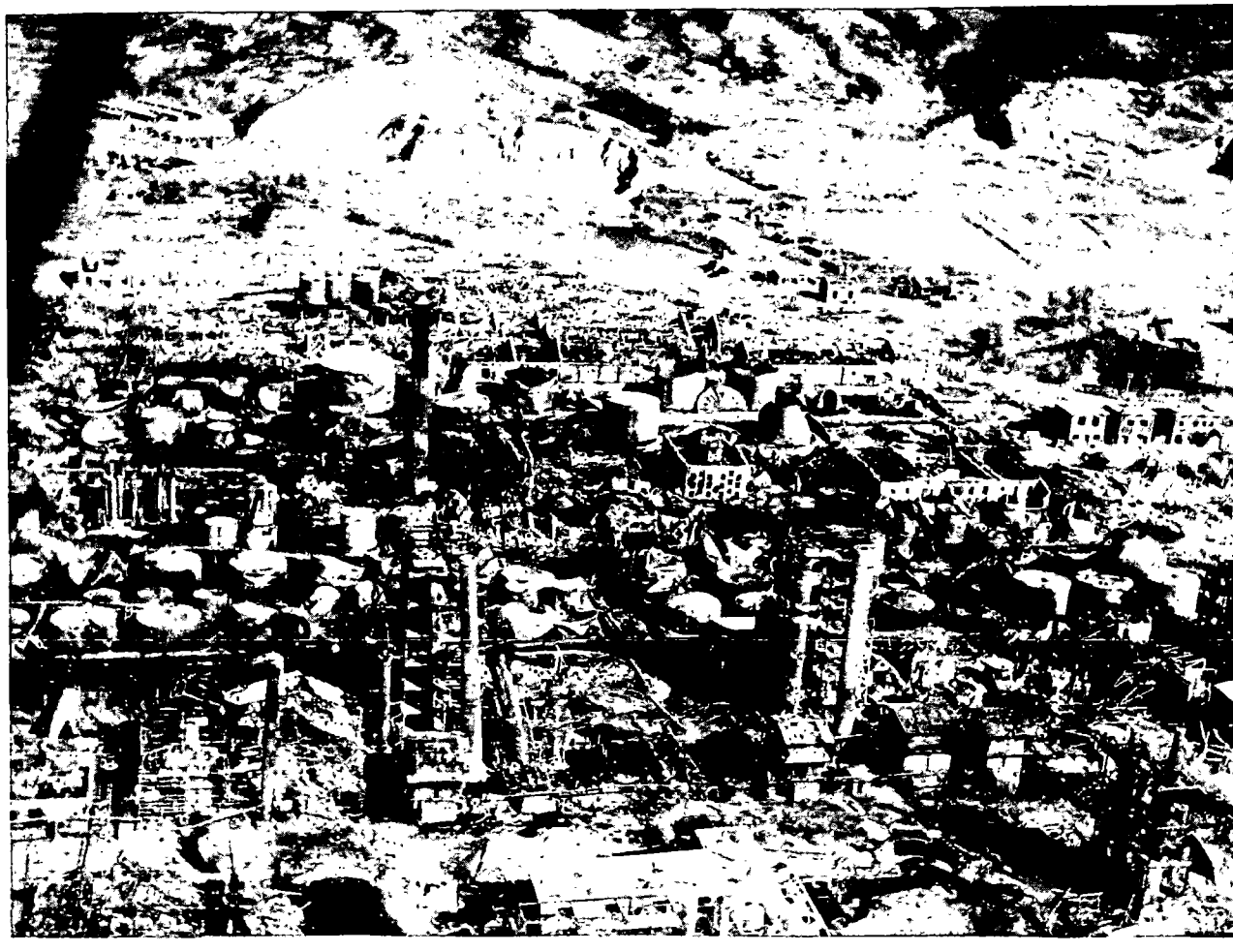


Figure 5-7. Destruction of oil refineries can severely handicap the enemy's POL resupply capability.

(10) *Denial of potable water.* The denial of potable water is feasible in swamp and forest areas with low elevations close to the sea, which have tidal streams. The water in such environments is saline and not fit to drink, and the low elevations preclude deep wells. Persons (including friendly forces, as well as hostile military/paramilitary forces, guerrillas, political cadre, and other insurgents) living in this type of area must thus provide their fresh water by impairing or trapping it during rainy seasons and by storing rainwater in manmade ponds or metal and pottery containers. Friendly forces operating in such areas should consider the destruction of stored potable water so as to deny it to the enemy. The possible adverse effect on the command and on the local population, however, must also be taken into account. Consideration should also be given to patrolling the waterways to prevent hostile for-

ces and their supporters from importing water. Denial of potable water is equally feasible in desert areas.

5-27. Materiel

a. The destruction of materiel is a command decision and, except in extreme cases, is done only on authority of a division or higher unit commander. The general policy is maximum evacuation and minimum destruction.

b. Local civilian materiel of strategic or tactical value should be denied the enemy, particularly if he is critically short of some items and requires the local items for further operations. The following items are among those which normally are denied to the enemy:

(1) Nuclear-energy facilities and related equipment.

(2) Bulk POL stocks.

(3) Locomotives and rolling stock.

(4) Critical industrial components, such as industrial diamonds, electronic equipment, ball and roller bearings, and aircraft engines.

(5) Highway transport equipment.

(6) Floating equipment and all harbor facilities, such as hoists, cranes, locks, and ship repair facilities.

5-28. Methods Used in Denial

a. Removal. Evacuation of material is as much a part of denial operations as destruction and should always be considered first. Evacuation must be started early and conducted in accordance with prepared priority lists. Selective removal can be quite useful; however, the capability of the enemy to replace missing components or complete items must be accurately assessed. Selective removal is most profitable when the item removed is already critical to the enemy. All like items (or selected components), including spares, must be removed. Technicians may be required for meticulous selective removal.

b. Destruction. Explosives are generally used for destruction; however, fire, water, and mechanical means can also be used. Destruction is planned so that the same part or assembly is destroyed on all similar items of equipment.

(1) Destruction by burning is a valuable technique; however, some materials that are considered to be capable of burning will not burn. The advice of engineers should be secured before planning destruction by burning. The security of the tactical operation must also be considered; intentions to withdraw may be given away by the burning.

(2) Rotating or reciprocating machinery usually requires lubrication to prevent damage from friction. Such machinery can be damaged or destroyed by removing or contaminating the lubricants. The operator of the machinery or a technician is the best source of advice on methods of rapid destruction of specific items of machinery.

(3) Water can damage many items beyond repair. The effectiveness of water as a destructive means should be checked with a specialist on the item or materiel. Destruction by water can usually be done quietly and without disclosing future plans or intentions.

(4) Mechanical methods (such as breaking with a sledgehammer) can also cause destruction. An informed operator can achieve maximum damage with a minimum of effort.

(5) Destruction by cutting vital metallic members of a structure with welding torches is simple, easily learned, and positive, but the equipment required is heavy.

(6) Thermite grenades are useful in denying certain targets; the intense heat produced fuses the metallic portions of the target or distorts them beyond usefulness. The use of thermite grenades must be planned in advance so that they and the experts to use them are available.

(7) Strong acids (e.g., nitric, sulfuric) properly applied can destroy many mechanisms and materials beyond economical repair; however, they are of marginal utility and of such special or limited application that their extensive use is not practical.

(8) Many industrial items can be made unusable with a small amount of a contaminating or adulterating substance. No one substance is universally applicable; therefore, technical familiarity with the target is required.

(9) Demolition by explosives is the most common method of destruction. It is certain, rapid, economical in cost, time, and materials,

and effective against most targets. FM 5–25 contains details on the employment of explosives.

c. Contamination. Contamination by chemical or radiological agents increases the denial effect by forcing the enemy to decontaminate or to wait until the contaminants have decayed to a safe level. Contaminants also can render an item temporarily unusable; however, items can be decontaminated. Further, the contaminating agents deteriorate and lose their effectiveness unless periodically refreshed. FM 3–10, FM 3–12, and FM 101–31–1 contain details on employment of chemical and radiological contaminants.

d. Atomic Demolition Munitions. Atomic demolition munitions (ADM) can destroy targets considered difficult or impossible to destroy. Frequent denial targets for the employment of ADM are airfields, defiles, underground installation, and tunnels. Relatively infrequent ADM targets are large masonry and concrete bridges, port complexes, POL storage and production facilities, supply installations, railroad facilities, dams, and industrial facilities. FM 5–26 contains details on the employment of ADM.

5–29. Planning Factors

FM 5–15, FM 5–25, FM 5–26, FM 5–34, FM 20–32, and FM 101–10–1 contain planning factors for specific types of obstacles and denial targets. These factors can be used for the rapid calculation of time, labor, materials, and transportation required to deny targets of similar qualities and characteristics.

APPENDIX A
REFERENCES

A–1. Army Regulations

AR 320–5	Dictionary of United States Army Terms (Short Title: AD).
AR 320–50	Authorized Abbreviations and Brevity Codes.

A–2. Department of the Army Pamphlets

DA Pam 108–1	Index of Army Films, Transparencies, GTA Charts, and Recordings.
DA Pam 310-series	Military Publications Indexes.

A–3. Joint Chiefs of Staff Publications

JCS Pub 1	Dictionary of United States Military Terms for Joint Usage.
JCS Pub 2	Unified Action Armed Forces (UNAAF).

A–4. Field Manuals

FM 3–8	Chemical Reference Handbook.
FM 3–10	Employment of Chemical and Biological Agents.
FM 3–12	Operational Aspects of Radiological Defense.
FM 3–50	Chemical Smoke Generator Units and Smoke Operations.
FM 5–15	Field Fortifications.
FM 5–25	Explosives and Demolitions.
FM 5–26	Employment of Atomic Demolitions Munitions (ADM).
FM 5–31	Boobytraps.
FM 5–34	Engineer Field Data.
FM 20–32	Landmine Warfare.
FM 20–33	Combat Flame Operations.
FM 21–5	Military Training Management.
FM 21–30	Military Symbols.
FM 21–40	Chemical, Biological, and Nuclear Defense.
FM 21–41	Soldiers Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare.
FM 27–10	The Law of Land Warfare.
FM 30–10	Terrain Intelligence.
FM 31–12	Army Forces in Amphibious Operations (The Army Landing Force).
FM 31–16	Counterguerrilla Operations.
FM 31–21	Special Forces Operations.
FM 31–23	Stability Operations—U.S. Army Doctrine.
FM 31–25	Desert Operations.
FM 31–30	Jungle Training and Operations.
FM 31–50	Combat in Fortified Areas and Built-up Areas.
FM 31–55 (TEST)	Border Security/Anti-Infiltration Operations.
FM 31–60	River Crossing Operations.
FM 31–71	Northern Operations.
FM 31–72	Mountain Operations.
FM 31–75 (TEST)	Riverine Operations.

FM 33–1	Psychological Operations—U.S. Army Doctrine.
FM 41–10	Civil Affairs Operations.
FM 54–2	The Division Support Command.
FM 54–8 (TEST)	The Administrative Support, Theater Army (TASTA–70).
FM 57–1	U.S. Army/U.S. Air Force Doctrine for Airborne Operations.
FM 57–35	Airmobile Operations.
FM 61–100	The Division.
FM 100–5	Field Service Regulations—Operations.
FM 100–10	Field Service Regulations—Administration.
FM 100–15	Field Service Regulations, Larger Units ,Theater Army, Corps.
FM 100–20	Field Service Regulations, Internal Defense and Development (IDAD) (U).
FM 101–5	Staff Officers' Field Manual: Staff Organization and Procedure.
FM 101–10	Staff Officers' Field Manual: Organization Technical, and Logistical Data, Unclassified Data.
FM 101–31–1	Staff Officers' Field Manual: Nuclear Weapons Employment, Doctrine, and Procedures.
FM 101–40	Armed Forces Doctrine for Chemical and Biological Weapons Employment and Defense.

A–5. Technical Manuals

TM 3–215	Military Chemistry and Chemical Agents.
TM 3–366	Flame Fuels.
TM 5–311	Military Protective Construction.
TM 5–370	Railroad Construction.
TM 9–1300–214	Military Explosives.
TM 9–1345–200	Land Mines.

APPENDIX B

BARRIER TRACE DELINEATION AND ARTIFICIAL OBSTACLE NUMBERING SYSTEMS

B-1. Barrier Trace Delineation

a. The barrier trace is a line drawing on a map, overlay, or sketch that shows the general locations for the construction of covering, forward, intermediate, rear, and flank barriers. It is usually part of the barrier plan. Figure B-1 illustrates a typical barrier trace. A uniform system for portraying the trace greatly assists in assigning barrier construction responsibility and designating and reporting specific obstacles in the trace.

b. The following rules or guidelines should be used for lettering identification points on the trace (fig. B-1):

(1) Identify the barrier trace, or portions thereof, by capital letters.

(2) Start lettering at the point where the barrier trace nearest the enemy crosses, or comes nearest to, the unit's left lateral boundary. This point is lettered "A."

(3) Proceed to the right along the trace (covering, forward, intermediate, or rear) and place letters alphabetically at boundaries of the next subordinate unit, at barrier trace intersections, and at other points to be identified. Continue alphabetical designation to the unit's right boundary, then down the boundary (or a flank trace) toward the next (forward, intermediate, or rear) trace. Discontinue lettering before the boundary or flank traces intersect with another trace and resume lettering alphabetically on the left end of the next (forward, intermediate, or rear) trace.

(4) Continue lettering until the entire trace is identified.

B-2. Artificial Obstacle Numbering System

a. The artificial obstacle numbering system uses three basic symbols. The first symbol is the numerical designation of the headquarters authorizing or directing the obstacle installation. The second symbol is the appropriate size-indicator of the authorizing or directing headquarters, and, if necessary, the abbreviation of the arm or branch of service. The third symbol is the numerical designation of the obstacle (see fig. B-2).

b. In the planning stage, a number is assigned to an obstacle by the headquarters authorized to direct its installation. This number is used with the obstacle throughout its development. The planning headquarters numbers obstacles and targets sequentially. The installing unit, if it is not the authorizing unit, need know only that the obstacle is authorized by its parent unit (e.g., 1st Bde, 20th Inf Div, authorizing obstacle 1-X(20 INF)-15, a minefield). From this point on, the important elements are the obstacle number (15, in this example) and the status (which in this case is (P)). The minefield number is then entered on DA Form 1355, Minefield Report. For security reasons, the first two symbols (e.g., 1-X(20 INF)) should not be shown on the minefield report so long as the report is subject to capture by the enemy.

c. A more detailed explanation of symbols employed in the artificial obstacle numbering system follows:

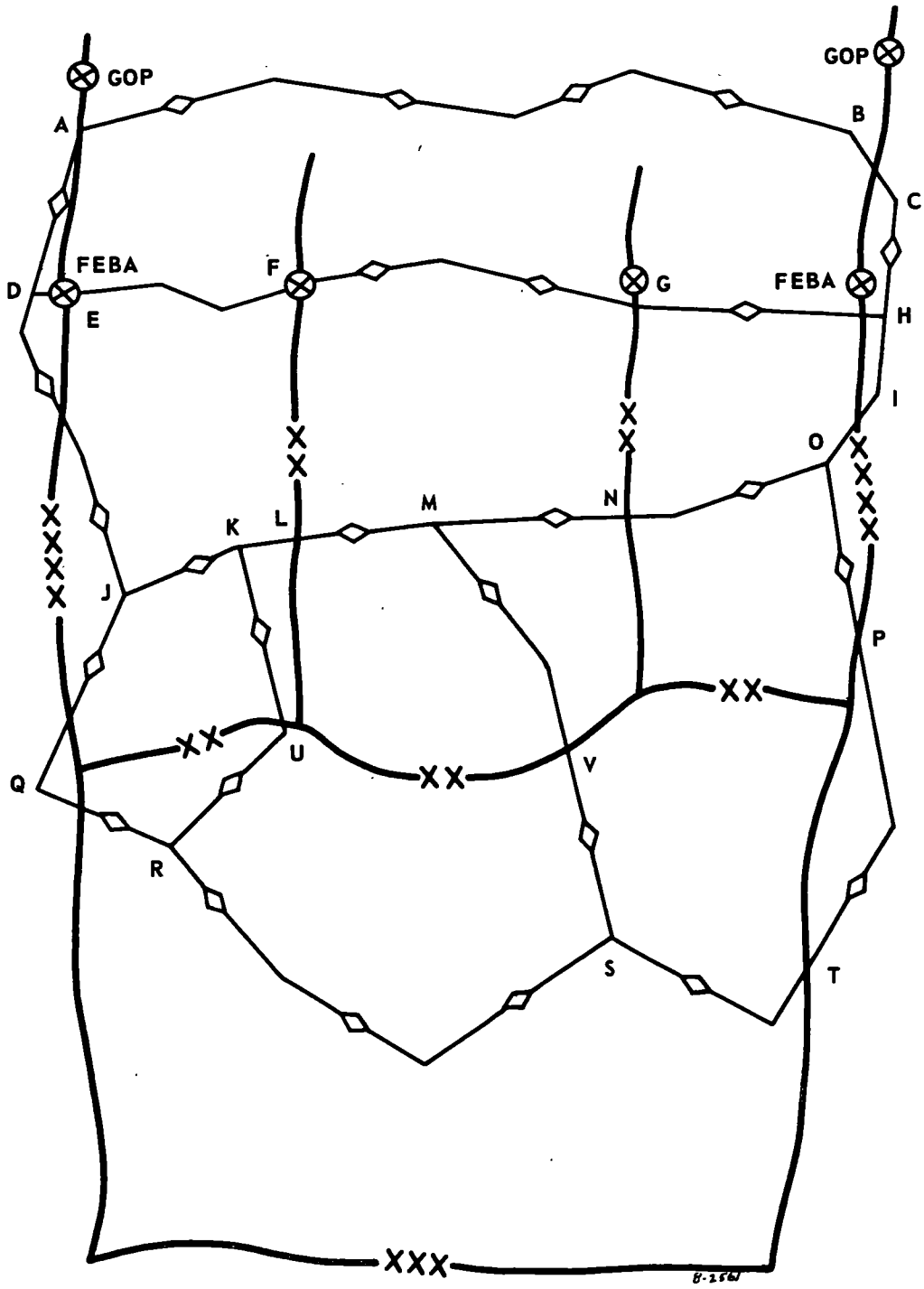
(1) *First symbol.*

(*a*) List the number and/or letter designation of the headquarters (field army, corps, division, brigade, or battalion) authorizing or directing installation of the obstacle.

(*b*) When company-sized units are delegated authority to install obstacles, the unit letter designation is placed in parentheses immediately in front of the designation of the parent unit and is made a part of the symbol; e.g., (C) 1-21 (INF).

(2) *Second symbol.*

(*a*) For brigades and higher units, the



LEGEND

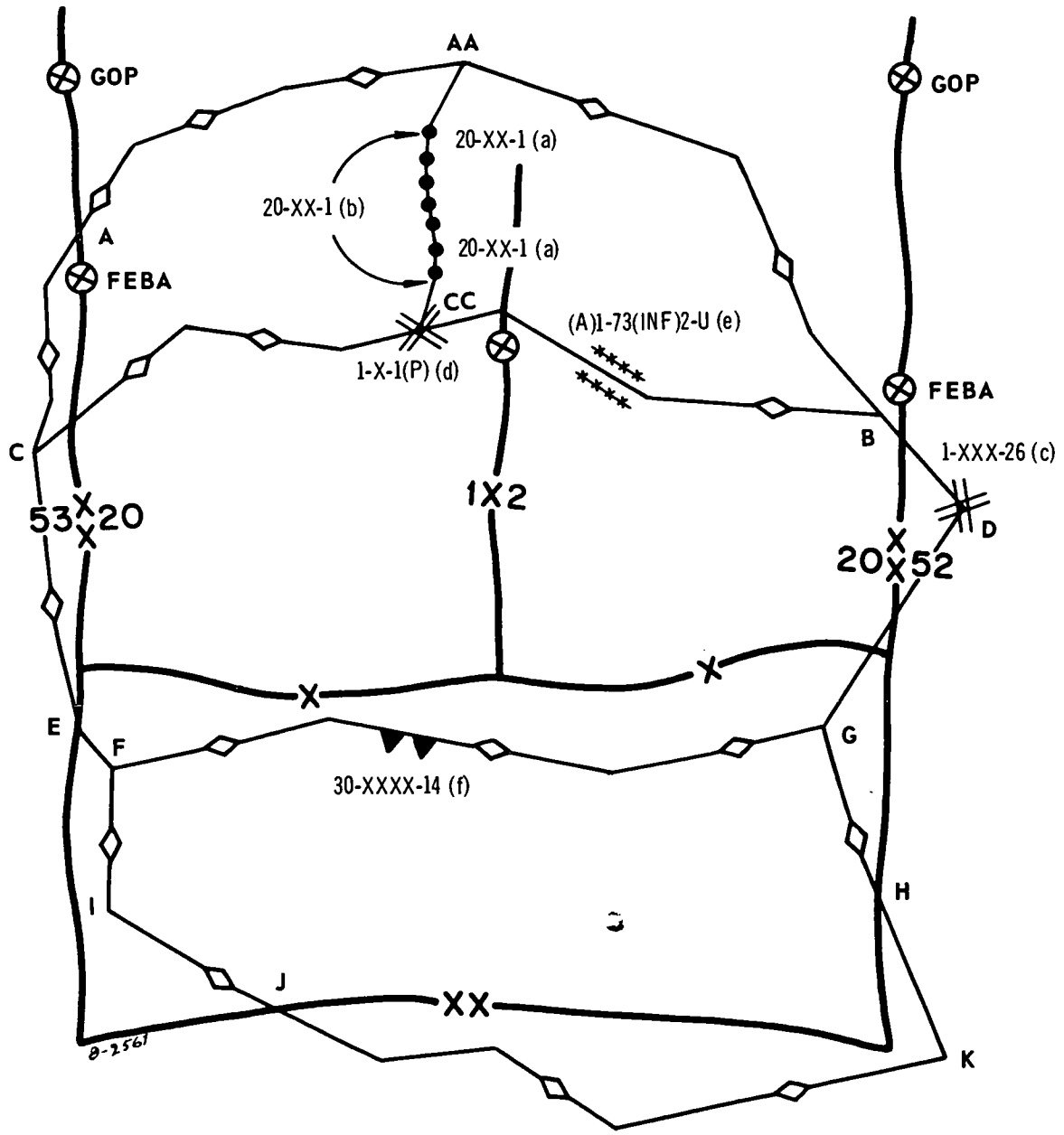
BARRIER TRACE

Barrier Trace: Shows location of coordinated series of obstacles:
NOT TO BE INTERPRETED AS ONE CONTINUOUS BARRIER.

NOTE: This is not a scale drawing. Gaps and lanes are not shown.

Figure B–1. Barrier trace delineation.

AGO 5329A



Example Obstacle	Designation	Remarks
(a) Mined route	20-XX-1	20th Division, obstacle number 1.
(b) Mined route	20-XX-1	Examples (a) and (b) show methods of delineating lineal obstacles.
(c) Road block	1-XXX-26	1st Corps, obstacle number 26.
(d) Road block	1-X-1(P)	1st Brigade, obstacle number 1, proposed.
(e) Double-double apron fence	(A)1-73(INF)2-U	Company A, 1st Battalion, 73d Infantry, obstacle number 2, under preparation.
(f) Open tank ditch	30-XXXX-14	30th Army, obstacle number 14.

Figure B–2. Obstacle numbering system.

appropriate size-indicator for the headquarters authorizing or directing installation of the obstacle is listed; e.g., XXXX for field army, XXX for corps.

(*b*) When necessary, special corps identification is made a part of the symbol; e.g., XXX (ABN) for airborne corps.

(*c*) When divisions with identical numbers are assigned to the same field army, the abbreviation for type of division is placed in parentheses and is made a part of the symbol; e.g., XX (ARMD), XX (INF), XX (MECH), XX (ABN).

(*d*) For brigades, the designation of the division is placed in parentheses and is made a part of the symbol; e.g., X (32 ARMD), X (14 INF), X (55 MECH), and X (152 ABN).

(*e*) For regiments and battalions, the abbreviation for the arm or branch of service is made a part of the symbol; e.g., INF for Infantry, ARTY for Artillery, CAV for Cavalry, and ENGR for Engineers.

(3) *Third symbol.* The third symbol is the sequential numerical designation of the obstacle as assigned by the headquarters authorizing or directing the installation.

(4) *Designation of obstacle status.* Though not actually a part of an obstacle's designation, the obstacle's status can be reported and recorded by the use of appropriate letters; e.g., (P) proposed, (U) under preparation, (R) ready but passable, or (E) executed. Percentage of completion can be shown by combining a number with (U); e.g., (U30) indicates that the obstacle is under preparation and is 30 percent completed.

d. Examples of complete obstacle numbers assigned under this system are as shown in figure B–2.

APPENDIX C
DENIAL ANNEX

C–1 Format: Denial Annex to Letter of Instructions, Operation Plan or Order

(Classification)

Copy No. _____.
Issuing headquarters
Place
Date and time
Message reference number

Annex (Plan) _____ (Denial) to Letter of Instructions (Operation Plan, Operation Order) _____.
References: (Maps, charts, and other pertinent documents.)

1. SITUATION

This paragraph contains information on the general overall situation that is essential to subordinates for understanding the current situtation and the relationship of the denial plan to the tactical plans.

a. Enemy Forces. This paragraph includes pertinent information regarding composition, disposition, location, movements, estimated strengths, identifications, and capabilities. This information is frequently shown by reference to an intelligence plan or annex.

b. Friendly Forces. This paragraph includes pertinent information on the responsibilities of commanders of friendly forces that may affect execution of the denial plan. Information is frequently shown by reference to an operation plan (operation order, letter of instructions). Support given by Navy, Air Force, and joint force commands is also included.

c. Assumptions. This paragraph includes those assumptions used as a basis for the plan (normally applicable only to higher command echelons).

2. MISSION

This paragraph is a clear, concise statement of the denial task to be accomplished by the command and its purpose.

3. EXECUTION

In separate lettered subparagraphs, this paragraph specifies the mission or responsibility of each subordinate command. It lists each specific target or class of targets by category (significant *tactical* targets and significant *strategic* targets), priority of execution, date or period within which execution must be accomplished, and other appropriate instruc-

(Classification)

(Short title identification) (Classification)

tions. The final subparagraph, Coordinating instructions, contains details of coordination and control measures applicable to two or more elements of the command or to the command as a whole. This subparagraph may include limitations on means of denial to be used, degree of destruction required or permitted, use of contaminants, and evacuation or disposition of indigenous population, including governmental officials and scientific personnel. The last subparagraph refers to appropriate appendixes, such as atomic demolition munitions appendix, contaminants appendix, demolitions appendix, and evacuation appendix.

4. ADMINISTRATION AND LOGISTICS

This paragraph contains instructions concerning combat service support arrangements for the execution of the denial plan, such as allocation of indigenous labor, use of local resources, transportation, and storage of emergency demolition material. Reference may be made to an administrative appendix, annex, or plan (order).

5. COMMAND AND SIGNAL

This paragraph contains instructions concerning signal and command including (when appropriate) reference to an SOP, SOI, or annex to an existing plan (order). An alert signal to commence the timephasing of the execution of demolitions is also included (may be in SOP or SOI). This paragraph also contains instructions for reports of intended location, extent, and type of demolitions, minefields, contaminants, and evacuations—as well as acknowledgment instructions.

(Commander)

Appendixes (include complete details of execution of target concerned)
Distribution
Authentication

C–2 Example: Denial Annex to Letter of Instructions (see fig. C–1)

(Classification)
Copy No 3 of____copies
U.S. Army Forces, FARBEN
WHEATON (CN5392), FARBEN
141600 October 19__
XZ 45

Annex F (Denial) to Letter of Instructions Number Seven
Reference: Map, FARBEN, 1:1,000,000.

1. SITUATION

a. Enemy Forces. Annex B (Intel) to Letter of Instructions Number Seven.

b. Friendly Forces.

(1) Letter of Instructions Number Seven.

(2) U.S. Nav Forces, OLYMPIC, conduct sea and air attacks against NORTH FARBEN and Aggressor-held ports, support U.S. Army Forces, FARBEN and interdict BLUE Sea coastal highway through MAJESTIC Mountains.

(Classification)

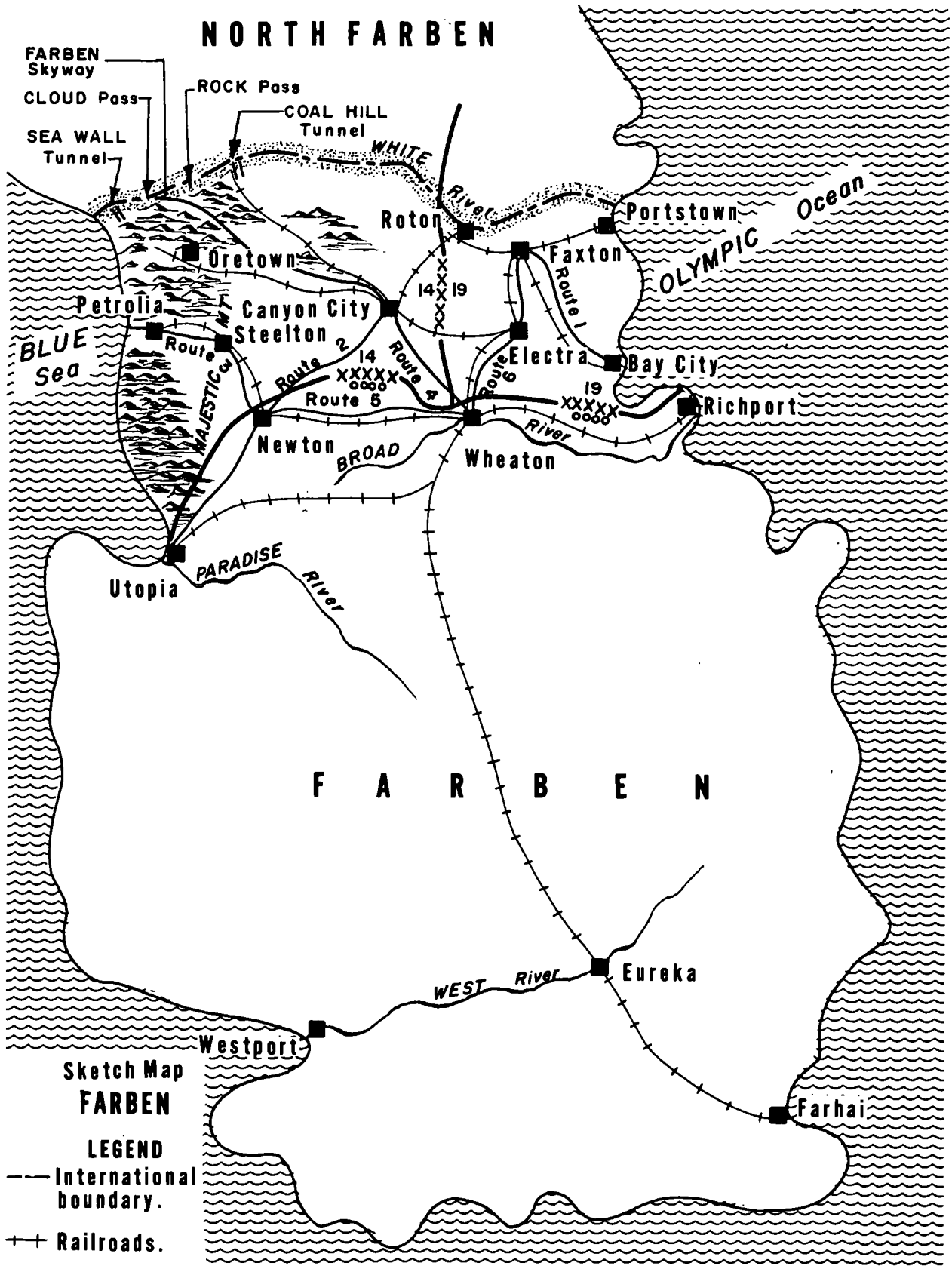


Figure C–1. Sketch map, FARBEN.

(Classification)

(Annex F (Denial) to LOI No Seven—U.S. Army Forces, FARBEN)

(3) USAF FARBEN, conduct air attacks against en transportation system and logistic installations and support U.S. Army Forces, FARBEN, with tactical, reconnaissance, and cargo acft.

c. Assumptions.

(1) Aggressor forces will reinforce and support North Farbenian attack if hostilities are resumed.

(2) Tactical nuclear weapons will be employed by both forces.

(3) Farbenian ground forces will not be available to reinforce the defense until 1 March 19__.

(4) Enemy forces may penetrate WHITE River line 3 days after launching attack.

2. MISSION

U.S. Army Forces, FARBEN, execute denial operations in MAJESTIC Mountains and on WHITE River to prevent en passage of MAJESTIC Mountains and to impede his advance across WHITE River, deny him strategic industrial facilities, and deny or impair his employment of transportation and logistic facilities in zone for min of 180 days.

3. EXECUTION

a. 14th Army Gp.

(1) Priority 1.

(a) Significant tactical targets.

Target	Remake
1. SEA WALL Tunnel. 2. CLOUD Pass. 3. ROCKY Pass. 4. COAL HILL Tunnel.	Prepare for atomic demolition munitions; demolish on resumption of hostilities or on denial alert signal.
5. All railroad and highway bridges over WHITE River in zone. 6. WHITE River dams in zone.	Demolish on resumption of hostilities or on denial alert signal.

(b) Significant strategic targets.

Target	Remake
1. Uranium and pitch-blende mines in zone.	Prepare for atomic demolition munitions; demolish if threatened with capture.
2. Nuclear energy plant, CANYON City.	Prepare for demolition, demolish if threatened with capture.
3. Oil refineries, PETROLIA.	

(2) Priority 2.

(a) Significant tactical targets.

* * * * * * *

b. 19th Army Gp.

(1) Priority 1.

(a) Significant tactical targets.

* * * * * * *

(Classification)

(Classification)

(Annex F (Denial) to LOI No Seven—U.S. Army Forces, FARBEN)

c. Coordinating Instructions.

(1) Priority one—evac all nuclear scientific personnel in zone to WHEATON to prevent capture.

(2) Priority two—evac principal Farbenian governmental officials of national, provincial, and municipal agencies in zone to WHEATON to prevent capture.

(3) Evac inhabitants of demolition areas prior to detonation of ADM.

(4) Employment of cml contaminants not authorized; prepare plans for possible future employment; flame mines authorized.

(5) Max evac preferred to destruction.

(6) Max destruction of ports, bridges, railroads, tunnels, airbases, POL facilities and stocks, and those industrial facilities valuable to war potential.

(7) All ADM, bridges over WHITE River, nuclear energy plant in CANYON City, oil refineries in PETROLIA, ore smelters in ORETOWN, and steel mills in STEELTON are *reserved* demolitions; control of execution will not be delegated below army level.

(8) Max delegation of execution of significant tactical targets to corps or lower echelons. Retain min essential execution authority at army group or army level.

(9) Max execution of significant strategic targets by army group or army. Require min essential execution of corps or lower echelons.

(10) Clear indigenous personnel within 32 kilometers of MAJESTIC Mountain passes and tunnels from the area; clear 16-kilometer zone along south bank of WHITE River of civilians, except essential war industrial personnel.

(11) Max utilization of indigenous personnel in evacuation program; min employment in destruction.

(12) Submit requirements for specialized demolition teams to assist in execution of significant strategic targets.

(13) Complete denial plans will not be distributed below army level.

(14) Appendix 1, Atomic Demolition Munitions.

(15) Appendix 2, Demolitions.

(16) Appendix 3, Chemical Contaminants.

(17) Appendix 4, Evacuation of Materiel.

(18) Appendix 5, Evacuation of Personnel.

4. ADMINISTRATION AND LOGISTICS

a. ADMINO 7.

b. Max use of indigenous resources to support displaced indigenous persons.

c. Max use of indigenous transportation facilities to evac specified indigenous personnel, supplies, and equipment.

d. Max use of indigenous demolitions equipment, materiel, and facilities.

(Classification)

(Classification)

(Annex F (Denial) to LOI No Seven—U.S. Army Forces, FARBEN)

5. COMMAND AND SIGNAL

a. Signal. Index 1–3, SOI.

b. Denial alert signal. Index 1–3, SOI.

c. Reports and Records.

(1) Atomic demolitions munitions. Appendix 1, Atomic Demolitions Munitions.

(2) Demolitions. Appendix 2, Demolitions.

(3) Minefields. Report intended location and extent of barrier minefields estimated time of completion and location of lanes and gaps.

(4) Persistent cml agents and mines. Appendix 3, Cml Contaminants.

(5) Evacuations.

(*a*) Appendix 4, Evacuation of Materiel.

(*b*) Appendix 5, Evacuation of Personnel.

Acknowledge.

ROBERTS
GEN

Appendixes: 1—Atomic Demolition Munitions (omitted)
2—Demolitions
3—Chemical Contaminants (omitted)
4—Evacuation of Materiel (omitted)
5—Evacuation of Personnel (omitted)

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WHEATON (CN5392), FARBEN
141600 October 19--
XZ 45

Appendix 2 (Demolitions) to Annex F (Denial) to Letter of Instructions Number Seven
Reference: Map, FARBEN, 1:1,000,000.

1. SITUATION

a. Enemy Forces. Annex B (Intel) to Letter of Instructions Number Seven.

b. Friendly Forces. Letter of Instructions Number Seven.

2. MISSION

Plan, prepare, and execute demolitions as directed to deny strategic facilities to en, to impede his advance, and to impair his employment of transportation and logistic facilities in zone.

(Classification)

(Classification)

Appendix 2 (Demolitions) to Annex F (Denial) to Letter of Instructions

3. EXECUTION

a. Priority items for destruction and preferred method of destruction for each type item are listed below:

(1) Oil refineries, PETROLIA.

(*a*) Cracking towers—explosives.

(*b*) Steamplants—explosives.

(*c*) Pumps—explosives.

(*d*) Cooling towers—fire.

(*e*) POL stocks—fire.

(2) Ore smelters, ORETOWN.

* * * * * * *

b. Coordinating Instructions.

(1) Max employment of indigenous demolition equipment, materiel, and facilities.

(2) Min employment of indigenous personnel in demolitions.

(3) Demolition sufficient to deny targets for a minimum of 180 days.

(4) Max employment of boobytraps after evac to hinder or prevent repairs and rehabilitation by en forces.

(5) Refer to specific field or TMs for details or methods of destruction.

4. ADMINISTRATION AND LOGISTICS

ADMINO 7.

5. COMMAND AND SIGNAL

a. Signal. Index 1–3, SOI.

b. Denial Alert Signal. Index 1–3, SOI.

c. Reports. Render reports on standard form to this headquarters. Include location, type, extent, estimated time of emplacement, unit responsible for execution, and estimated delay or denial to be accomplished. Acknowledge.

ABLE
GEN

Distr: A
OFFICIAL
/s/Bright
BRIGHT
G3

(Classification)

APPENDIX D
BARRIER ANNEX

D-1. Barrier (and Denial) Plans.
Barrier plans, which are prepared by field army and lower headquarters, are designated as barrier and denial plans when denial-type targets are included in the plan.
D-2. Format: Barrier (and Denial) Annex to an Operation Plan or Order.

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Copy No. _____
Issuing headquarters
Place
Date and time
Message reference number

Annex _____ (Barrier (and Denial)) to Operation Plan (Order) _____
References: (Maps, charts, and other pertinent documents.)

1. SITUATION

This paragraph contains essential information on the general overall situation to give subordinates an understanding of the current situation and the relationship of the barrier plan to tactical plans.

a. Enemy Forces. This paragraph includes pertinent information regarding composition, disposition, location, movements, estimated strengths, identifications, and capabilities. Information is frequently shown by reference to an intelligence plan or annex.

b. Friendly Forces. This paragraph includes pertinent information on the responsibilities of commanders of friendly forces that may affect execution of the barrier plan. Information is frequently shown by reference to an operation plan (order).

c. Attachments and Detachments.

d. Assumptions. This paragraph includes those assumptions required to provide a common basis for planning.

2. MISSION

This paragraph is a clear, concise statement of the barrier task to be accomplished by the command and its purpose.

3. EXECUTION

The concept subparagraph includes the designation of any specific barriers deemed vital to the command as a whole, the general location concept of barriers to be constructed—frequently shown by reference to an overlay

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(Short title identification)

or overprinted map, and the general priority of barrier construction. The separate lettered subparagraphs give the specific task or responsibility of each subordinate command. This paragraph lists each barrier; denial target (when applicable) by category (significant *tactical* targets and significant *strategic* targets) and desired degree of destruction; specific priority of construction or execution; date or period within which construction or execution must be accomplished; code numbers of specified obstacles; and other appropriate instructions. The final subparagraph, Coordinating Instructions, gives details of coordination and control measures applicable to two or more elements of the command or to the command as a whole. This subparagraph may include restrictions or limitations on the employment of certain artificial obstacles by type or area, such as minefields, nuisance mines, boobytraps, chemical or radiological contamination, atomic demolition munitions, gaps, lanes, important routes to be kept open, and areas important to the command for tactical and combat service support operations as well as for future operations; any required coordination; code systems and instructions for numbering individual obstacles and reporting state of readiness (if not SOP items); authority for the construction of additional barriers, if desired; instructions regarding the submission of detailed barrier and obstacle plans; and instructions relative to the security of barrier plans. In this subparagraph, refer to appropriate appendixes, such as atomic demolition munitions appendix, minefield location appendix, contaminants appendix, and demolitions appendix. Appendixes will include complete details of execution.

4. ADMINISTRATION AND LOGISTICS

This paragraph contains instructions concerning combat service support arrangements for the execution of the barrier plan, such as allocation of indigenous labor, materiel, and transportation, and use of local resources. Reference may be made to an administrative appendix, annex, or plan (order).

5. COMMAND AND SIGNAL

This paragraph contains instructions concerning signal and command, including (when appropriate) references to an SOP, SOI, or annex to an existing plan (order). This paragraph also contains instructions for reports of intended location, extent, and type of minefields, demolitions, contaminants, and other obstacles—as well as acknowledgment instructions.

(Commander)

Appendixes
Distribution
Authentication

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D–3. Example: Barrier and Denial Annex to Army Operation Order

(Classification)

Copy No. 2 of _____ Copies
30th Army
SESANA (VL1263)
250800 June 196__
CY 322

Annex H (Barrier and Denial) to OPORD 6
Reference: Map, The Balkans, 1:250,000, VIROVITICA—KARLOVAC.

1. SITUATION

a. Enemy Forces. Annex B (Intelligence) to OPORD 6.
b. Friendly Forces. OPORD 6.
c. Attachments and Detachments. OPORD 6.

2. MISSION

30th Army executes barriers and conducts denial operations in sector to delay en south and west of the DRAVA River, to impede en passage of the SAVA River, to delay and canalize en movement in sector, and to inflict casualties on the enemy.

3. EXECUTION

a. Concept of Operation.

(1) 30th Army employs barriers and conducts denial operations in sector with priority to key avenues of approach. Max use will be made of natural obs and locally available materials.

(2) Appendix 1, Barrier Location Concept, indicates the general trace of army-required barriers. As a minimum, roads and other high-speed avenues of approach will be blocked in depth.

(3) Unless otherwise specified, 30th Army barriers will be constructed in the general order of priority as follows:

(*a*) Covering barrier (DRAVA River) and fwd barrier (SAVA River).
(*b*) Rear barrier and south flank barrier.
(*c*) North flank barrier.
(*d*) Intermediate barriers.

b. 1st Corps:

Barrier/target	Priority	Remarks
AB	1	As a minimum, destroy all DRAVA River bridges in sector.
EFG	1	As a minimum, destroy all SAVA River bridges in sector.
EJ	2	Make max use of aerially delivered mines in constructing barrier.
FK	2	Coord gaps and lanes with 2d Corps.

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(Classification)

(Annex H to OPORD 6—30th Army)

c. 2d Corps:

Barrier/target	Priority	Remarks
BC	1	As a minimum, destroy all DRAVA River bridges in sector.
GH	1	As a minimum, destroy all SAVA River bridges in sector. Report location of gaps and lanes.
Tgt 30–XXXX–9, nuclear energy plant.	1	Remove components and execute demolitions in accordance with appendix 4, Demolitions.
Tgt 30–XXXX–14, RR and hwy routes vicinity KARLOVAC.	2	Prepare for nuclear demolition. Execute only on order this headquarters.

d. 3d Corps:

* * * * * * *

e. 50th Engr Bde (Army):

Barrier/target	Priority	Remarks
JLM	1	Coord gaps and lanes with 1st Corps in sector.
MNO	1	Coord gaps and lanes with 2d (US) and 3d Corps in sectors.
Tgt 30–XXXX–20, RR tunnel at VL8928.	2	Prepare for nuclear demolition. Execute only on order this headquarters.
* *	*	* * * *

f. 10th Denial TF:

Barrier/target	Priority	Remarks
Tgt 30–XXXX–15, locomotive works vic KARLOVAC (WL4338).	1	Coord with 2d Corps. Prepare for demolition. Execute only on order this headquarters.
* *	*	* * * *

g. Coordinating Instructions.

(1) Locate barriers to cause max delay to the en and min interference in the execution of tactical operations, including the withdrawal of covering forces. Provide sufficient gaps in interior barriers so that reserves can move freely in rear of or within the battle area.

(2) Coord location of barriers along boundaries, including gaps and lanes, with adjacent and reserve units.

(3) Select nuclear targets near the army left (west) boundary, employing surface or subsurface bursts to capitalize on the secondary effects of fallout and induced radiation. Army approval is required before actual employment.

(4) Close army-directed gaps and lanes behind FEBA only on army order.

(5) Prepare plans for the use cml contaminants to increase the effectiveness of obs and barriers. Army approval is required before actual employment. Use of napalm in the construction of incendiary landmines is authorized without further approval.

(6) Employment of nuisance minefields is not authorized.

(Classification)

(Classification)

(Annex H to OPORD 6—30th Army)

(7) Other than those specified, keep destruction of population centers, transportation facilities, utilities, mines, factories, and installations to a minimum.

(8) Forward corps barrier location concepts to this headquarters by 270700 June.

(9) Do not distribute complete army barrier and denial plan below corps; appropriate extracts authorized as far forward as div and bde.

(10) Records and Reports.

(*a*) Minefields. Appendix 2, Minefield Location. Submit reports of intent to construct, initiate, complete, or change by fastest means available consistent with signal security. Follow with written standard record on all but protective minefields.

(*b*) Contaminants. Appendix 3, Chemical Contaminants. Report intended location, extent, type and density, estimated time of completion, and estimated delay to be accomplished.

(*c*) Demolitions and other obstacles. Appendix 4, Demolitions. Appendix 5, Nuclear Demolitions. Report location, type, estimated time of completion, and execution.

4. ADMINISTRATION AND LOGISTICS

30th Army ADMINO 9.

* * * * * * *

5. COMMAND AND SIGNAL

Annex K (Signal) to OPORD 6.

Acknowledge.

BURGHARDT
General

Appendixes: 1—Barrier Location Concept
2—Minefield Location (omitted)
3—Chemical Contaminants (omitted)
4—Demolitions (omitted)
5—Nuclear Demolitions (omitted)

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D–4. Example: Barrier and Denial Plan Annex to Corps Operation Order

Copy No. 2 of _____ copies
2d (US) Corps
FIUME (VL5520)
261900 June 19__
CY 123

Annex F (Barrier and Denial) to OPORD 14

Reference: Map, The Balkans, 1:250,000, VIROVITICA—KARLOVAC.

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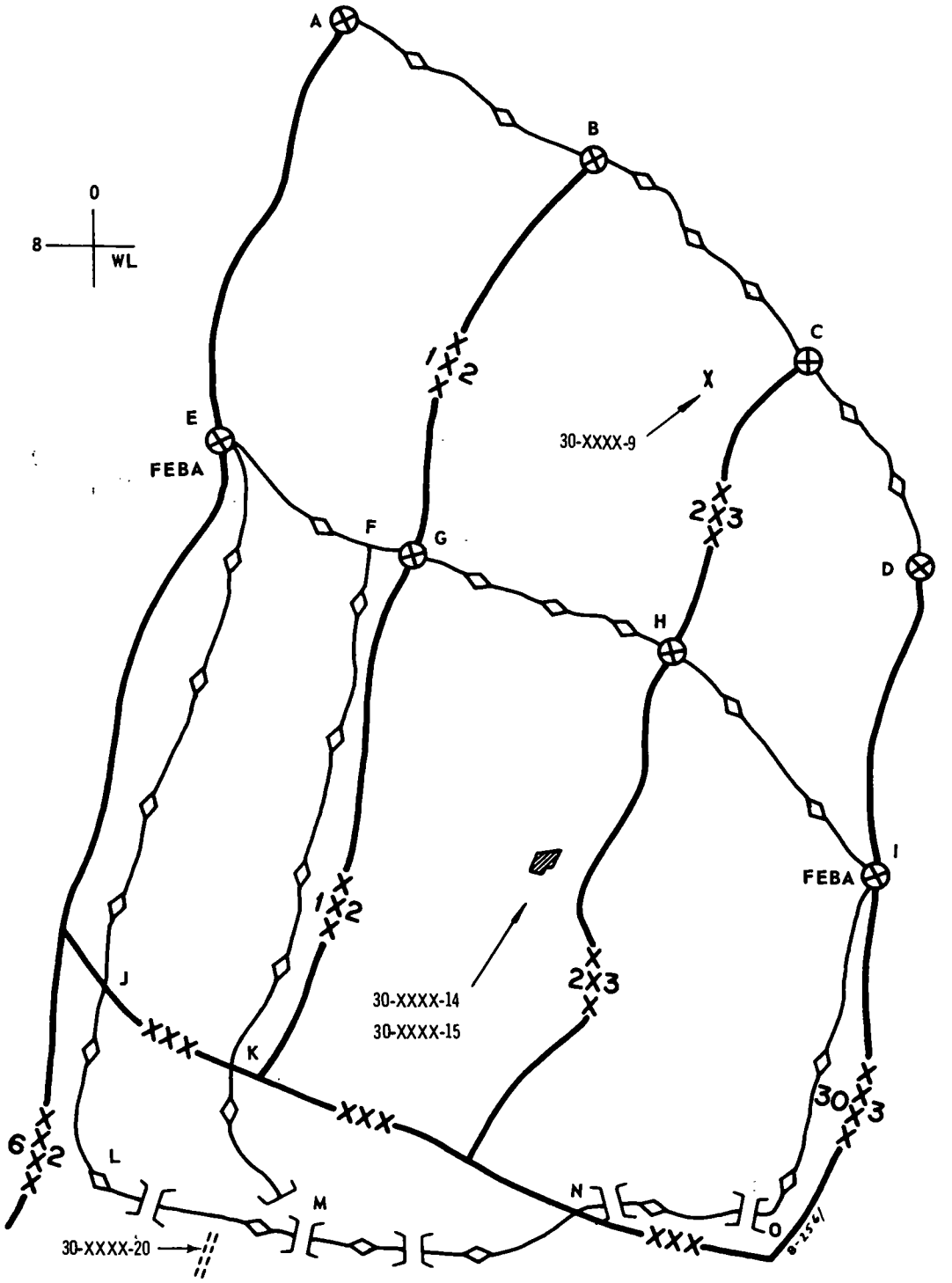
(Annex F to OPORD 14—2nd Corp)



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(Annex F to OPORD 14—2nd Corp)

1. SITUATION

a. Enemy Forces. Annex B (Intelligence) to OPORD 14.

b. Friendly Forces.

(1) Annex C (Operation Overlay) to OPORD 14.

(2) 30th Denial TF (Army) responsible for preparation and execution of 30th Army target 15, locomotive works vicinity KARLOVAC (WL4338).

(3) 1st Corps constructs 30th Army designated barrier north of 2d Corps sector from WL0369 to WL4583.

c. Attachments and Detachments. Det A, 50th Engr Bde (Army), attached 261200 June.

2. MISSION

Corps executes barrier system in sector to delay, impede, canalize, and inflict casualties on the enemy.

3. EXECUTION

a. Concept of Operation. Appendix 1, Barrier Location Concept.

(1) 2d Corps employs barriers to delay, impede, and canalize Aggressor movement fwd of the SAVA River during his crossing of the SAVA River, and to slow or halt en penetrations within the corps sector.

(2) Unless otherwise specified, barriers will be constructed in the general order of priority as follows:

(*a*) Covering and fwd barriers.

(*b*) Barriers designed to stop or slow en penetrations vicinity of line MAC and south flank barrier.

(*c*) Rear barrier.

(*d*) Intermediate barriers.

b. 19th Inf Div:

Barrier/target	Priority	Remarks
OKL	1	Coord with counterattack plans.

c. 20th Inf Div:

Barrier/target	Priority	Remarks
CDE	1	Coord location of gaps and lanes with 23d Armd Div. Corps-designated gaps and lanes closed only on order this HQ.
CIG	2	Coord location of gaps and lanes with counterattack plans (app 2, Minefield Locations).
GD	2	Coord location of gaps and lanes with 52d Mech Div, 23d Armd Div, and corps counterattack plans.
Tgt 2-XXX-5	1	Route mine ZAGREB—BELGRADE highway in sector. Coord with 23d Armd Div and 56th Mech Div.
Tgt 2-XXX-7, bridge	1	Prepare for demolition. Execute only on order this HQ prior to withdrawal of 23d Armd Div; thereafter authority to execute delegated to div.

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(Classification)

(Annex F to OPORD 14—2d Corps)

Barrier/target	Priority	Remarks
Tgt 2-XXX-8, RR and hwy bridge vic ZAGREB (WL7471).	1	Prepare for demolition. Execute only on order this HQ prior to withdrawal of 23d Armd Div; thereafter authority to execute delegated to div.
Tgt 2-XXX-9, ferry site, ZAGREB (WL7671).	1	Prepare for demolition. Execute only on order this HQ prior to withdrawal of 23d Armd Div; thereafter authority to execute delegated to div.

d. 52d Mech Div:

Barrier/target	Priority	Remarks
EF	1	Coord location of additional gaps and lanes with 23d Armd Div. Corps-designated gaps and lanes closed only on order this HQ.
FH	2	Coord gaps and lanes and destruction of bridges with 3d Corps and 201st Armd Cav Regt.
GH	2	Coord location of gaps and lanes with corps counterattack plans.
Tgt 3-XXX-4	1	Route mine ZAGREB—BELGRADE highway in sector. Coord with 23d Armd Div and 20th Inf Div.
Tgt 3-XXX-8, bridge, SISAK (XL0737).	1	Prepare for demolition. Execute only on order this HQ prior to withdrawal of 23d Armd Div; thereafter authority to execute delegated to div.

e. 23d Armd Div:

Barrier/target	Priority	Remarks
AB	1	As a minimum, destroy all bridges in sector.
MNO	On order	On withdrawal from covering force mission coord with corps engr; assist in construction on order.
Tgt 30-XXXX-9, nuclear energy plant at XM5801.	1	Det A, 50th Engr Bde (Army), attached 23d Armd Div effective 261200 June. Released from attachment on passage of FEBA. Execute target in accordance with special instructions.
Tgt 3-XXX-1, vic KOPRIVNICA (XM4114).	1	Prepare for nuclear demolition. Destroy RR and highway routes leading to southwest.
Tgt 3-XXX-2	2	Route mine ZAGREB—VARAZDIN highway from KOMIN (WL9995) to GOP. Coord with 20th Inf Div.

f. 201st Armd Cav Regt:

Barrier/target	Priority	Remarks
HL	1	Coord gaps and lanes and destruction of bridges with 52d Mech Div and 3d Corps.

g. 53d Engr Bde (Corps):

* * * * * * *

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(Classification)

(Annex F to OPORD 14—2d Corps)

h. Coordinating Instructions.

(1) Coord gaps and lanes with withdrawal plans of corps covering force.

(2) Gaps and lanes in corps-directed barriers behind FEBA closed only on corps order.

(3) Coord gaps and lanes in div-directed barriers with corps counterattack plans. Max use of phony minefields in gaps and lanes for counterattack use.

(4) Demolition of roads and bridges to the rear of the FEBA authorized only on corps order.

(5) Prepare plans for the use of cml contaminants to increase the effectiveness of obstacles and barriers. Corps approval is required before actual employment. Use of napalm in the construction of incendiary landmines is authorized without further approval.

(6) Employment of nuisance mines is not authorized.

(7) Complete and fwd barrier location concepts to this headquarters by 281300 June.

(8) Do not distribute complete corps barrier and denial plan below div or armd cav regt; extracts authorized to bn level.

(9) Records and reports.

(*a*) *Minefields.* Appendix 2, Minefield Location. Report intended location, initiation, estimated time of completion, changes, and type and density of mines; follow with std minefield laying report including sketches of all protective minefields.

(*b*) *Demolitions and other obstacles.* Appendix 3, Demolitions. Appendix 4, Nuclear Demolitions. Report location, extent, type, estimated time of completion, and execution per SOP.

4. ADMINISTRATION AND LOGISTICS

a. Antitank and antipersonnel mines, demolitions, and napalm available at ammunition supply points vicinity LUG (WL4545) and ROZANBREG (WL5943) by 280800 June.

b. Minefield marking materials, wire, and fortification material available at heavy material supply installation VUKOV GORICA (WL2634) by 281200 June.

c. Annex H (Logistics) to OPORD 14.

5. COMMAND AND SIGNAL

Annex I (Signal) to OPORD 14.
Acknowledge.

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(Annex F to OPORD 14—2d Corps)

OLIVER
LTG

Appendixes: 1—Barrier Location Concept
2—Minefield Locations
3—Demolitions
4—Nuclear Demolitions

Distribution: Same as OPORD 14

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MARTIN
G3

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Appendix 2 (Minefield Location Plan) to Annex F (Barrier and Denial) to OPORD 14

1. SITUATION

a. Enemy Forces. Annex A (Intelligence) to OPORD 14.

b. Friendly Forces. OPORD 14.

2. MISSION

Corps emplaces minefields in sector to delay, impede, and canalize en movement.

3. EXECUTION

(Classification)

(App 2 to Annex F to OPORD 14—2d Corps)

a. Target Tabulation.

Barrier	Priority	Estimated completion date	Location		Approx Mines		Approx [1] plat hrs	Prep unit	Remarks
			Area name	Grid coord	AT	APers			
CIG	1	022000 Jul	KUPINEC to DRAGONOZEC	WL6257 WL7656	30,000	160,000	1,000	20th Div	Div comdrs integrate minefields into the overall unit defense along line MAC.
UWV	2	032000 Jul	TREPCA	WL6128	9,000	.....	150	53d Engr Bde	Survey minefield sites, wire in, stake centerlines, stockpile mines, and prepare to lay. Field will be laid by standby personnel on corps order.
*	*	*			*		*	*	* * * *
Minefield					156,000	240,000			

[1] Estimated on-site labor requirements for minelaying only.

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(Classification)

(Classification)

(App 2 to Annex F to OPORD 14—2d Corps)

b. Coordinating Instructions.

(1) Use nonmetallic mines and antihandling devices to the max available. Use trip flares in lieu of antipersonnel mines when requirement for warning rather than casualty effect predominates.

(2) Security and safety.

(*a*) Cover active minefields by security elements or friendly observation. Laying units are responsible for accurate recording and guarding to prevent friendly personnel or vehicles from entering live fields.

(*b*) Until minefields are passed through by all withdrawing forces, clearly mark all minefield lanes with standard lane markers.

(*c*) Report removal or alteration of any minefield immediately to this headquarters.

(3) Additional Mining. Corps supporting units make recon and survey their respective barrier lines for possible employment of additional defensive, phony, and nuisance minefields other than for demolition targets or facilities denial; fwd recommendations and requests to this headquarters by 272000 June for approval to install.

4. ADMINISTRATION AND LOGISTICS

a. Army ADMINO 9.

b. Supply. Draw mines required, over stocks presently maintained by units, from supply points and depots as indicated in Annex C (Engineer) to Army ADMINO 9.

5. COMMAND AND SIGNAL

a. Signal. Index 1–7, SOI.

b. Reports and Records. Submit required reports of intent to lay, initiation, completion, and change by fastest means available consistent with signal security. Follow with written std record in prescribed number of copies as soon as possible on all but protective minefields. Acknowledge.

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D–5. Example: Barrier Plan Annex to Division Operation Order

Copy No. 2 of _____ copies
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KARLOVAC (NL4238)
281200 June 19__
CY 4

Annex C (Barrier and Denial) to OPORD 36
Reference: Map, The Balkans, 1:50,000, VIROVITICA.

(Classification)

(Classification)

(Annex C (Barrier and Denial) to OPORD 36—20th Inf Div)

1. SITUATION

a. Enemy Forces. Annex A (Intelligence) to OPORD 36.

b. Friendly Forces.

(1) OPORD 36.

(2) 535th Engr Bn (Cbt) : DS 20th Inf Div.

c. Attachments and Detachments. Task organization to OPORD 36.

2. MISSION

Div prepares barrier system in sector to impede en passage west of the SAVA River, to inflict casualties on the en, and to slow or halt en east of line MAC.

3. EXECUTION

a. Concept of Operation.

(1) 20th Inf Div installs barriers, making max use of natural obstacles and locally available materials.

(2) Barrier location concept (attached). Prepare road and railroad bridges for demolition and to block roads, defiles, fords, and trails in depth.

(3) Min destruction of civilian public and private property consistent with missions.

(4) Barriers will be prepared in the following priorities:

(*a*) Barrier C–B–C–D.

(*b*) Barrier CG.

(*c*) C–E–F–G.

(*d*) Others.

b. 1st Bde:

Barrier/target	Priority	Remarks
A–B	1	Mine fords. Improve natural obstacle—SAVA River.
Tgt 2–XXX–7, bridge PODSUED (WL6474).	1	Prepare for demolition. Execute only on order of 2d Corps HQ prior to withdrawal of 23d Armd Div; thereafter execute only on order of this HQ.
AE	2	Improve natural obstacles to deny enemy penetration west of line MAC.

c. 2d Bde:

* * * * * * *

f. Coordinating Instructions.

(1) Nuisance mines will not be employed.

(2) Gaps and lanes in div-directed barriers closed only on div order or if capture is imminent. Request additional gaps and lands as necessary. Coord location of all gaps and lanes with div reserve.

(3) Demolition of bridges and catering of roads only on div order or if capture is imminent.

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(Classification)

(Annex C (Barrier and Denial) to OPORD 36—20th Inf Div)

(4) Coord location of barriers along boundaries.

(5) 20th Engr Bn coord connection of GJ with 52d Engr Bn (52d Mech Div).

(6) Complete and fwd barrier plans to this headquarters by 282300 June.

(7) Do not distribute complete div barrier and denial annex below bn; extracts to company level.

4. ADMINISTRATION AND LOGISTICS

a. Antitank and antipersonnel mines, demolitions, and napalm available (unit distribution) ASP 810 (WL3140). Request quantities needed.

b. Class IV materials (minefield marking and fortification materials) available (unit distribution) 2032d Hv Mat Sup Co (WL1547). Request quantities needed.

c. Employment of civilian labor not authorized.

5. COMMAND AND SIGNAL

a. Annex G (Signal) to OPORD 36.

b. Reports.

(1) Minefields. Report intent, initiation, and completion by fastest secure means available; follow with std minefield reports.

(2) Demolitions and other obstacles. Report location, type, completion time, and execution (demolitions).

Acknowledge.

EDGAR
MG

Appendixes: 1—Barrier Location Concept
2—Demolitions
3—Atomic Demolition Munitions (omitted)

Distribution: A
535th Engr Bn (Cbt)

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CARTER
G3

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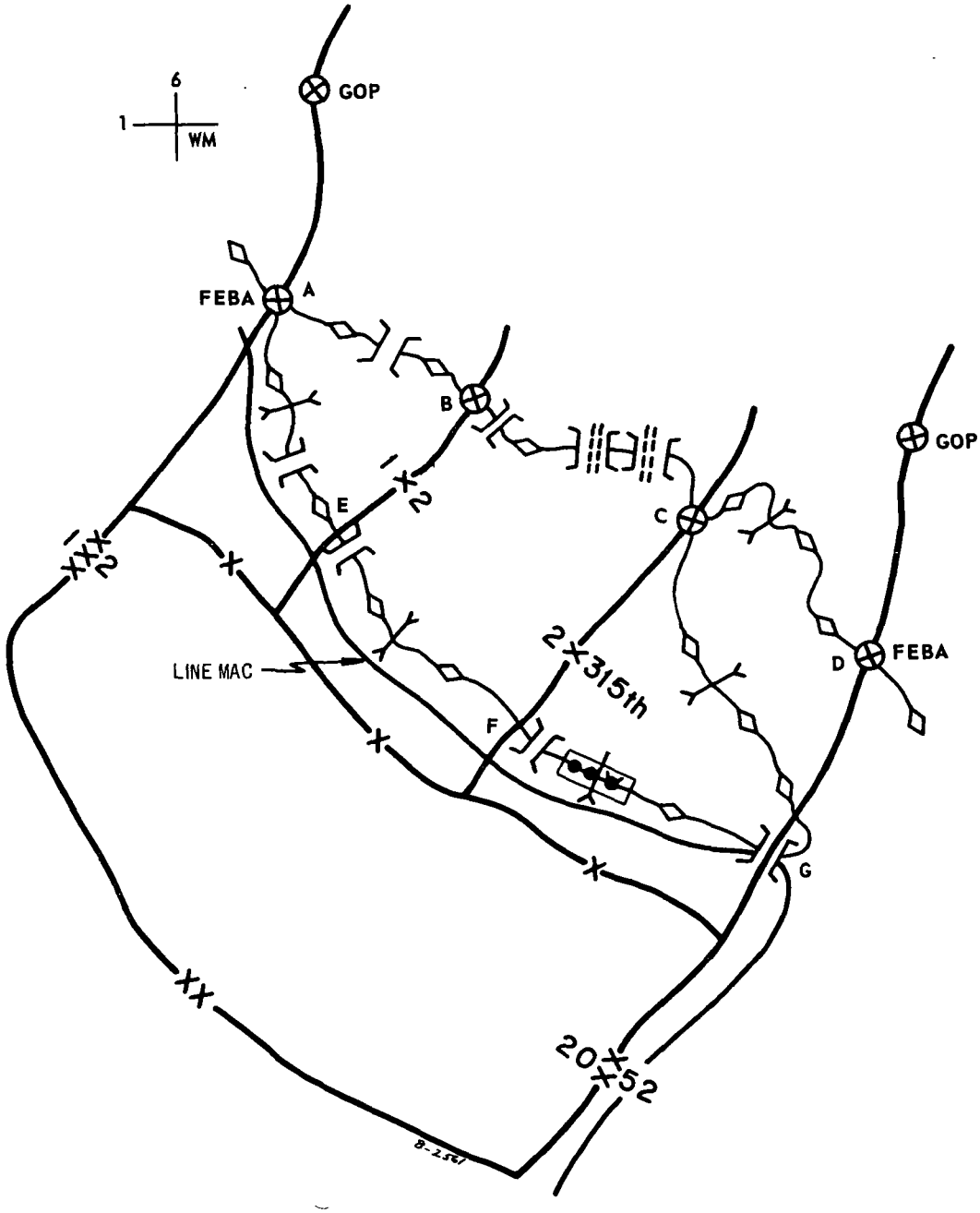
(Classification)

(Annex C (Barrier and Denial) to OPORD 36—20th Inf Div)



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KARLOVAC (NL4238)
281200 June 19__
CY 4

Appendix 2 (Demolitions) to Annex C (Barrier and Denial) to OPORD 36

1. SITUATION

a. Enemy Forces. Annex A (Intelligence) to OPORD 36.

b. Friendly Forces. OPORD 36.

2. MISSION

Div prepares and executes demolitions in sector on order to delay, impede, or canalize en movement.

3. EXECUTION

(Classification)

(App 2 to Annex C to OPORD 36—20th Div)

a. Target Tabulation.

Barrier	Priority	Completion date	Location		Target	Explosives reqd (lb)	Approx [1] plat hr	Prep unit	Remarks
			Area name	Grid coord					
A–B	1	282400 Jun	PODSUSED	WL645746	2–XXX–7	2,300	1	1st Bde	Prepare for demolition. Demolish only on order of 2d Corps HQ prior to withdrawal of 23d Armd Div. Thereafter execute only on order of this HQ.
B–C	1	282400 Jun	ZAGREB	WL747710	2–XXX–8 Hwy Bridge	4,000	2	2d Bde	Prepare for demolition. Demolish only on order of 2d Corps HQ prior to withdrawal of 23d Armd Div. Thereafter execute only on order of this HQ.
			ZAGREB	WL761711	2–XXX–9 Ferry Site	1,500	1	2d Bde	Prepare for demolition. Demolish only on order of 2d Corps HQ prior to withdrawal of 23d Armd Div. Thereafter execute only on order of this HQ.
			ZAGREB	WL760746	4–XX–20 Roadblock	1,000	1	2d Bde	Prepare for demolition. Demolish on order of this HQ.

[1] Estimated on-site labor requirements for minelaying only.

(Classification)

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(Classification)

(App 2 to Annex C to OPORD 36—20th Div)

b. Execute bridge and other transportation facility demolitions in rear of the FEBA only after div clearance or release of control of route or routes.

4. ADMINISTRATION AND LOGISTICS

a. Demolitions available (unit distribution) ASP 810 (WL3140).

b. Draw explosives and mines required in excess of current stocks carried in units from supply points and depots as indicated in Annex F (Engineer) to OPORD 36.

c. Employment of civilian labor not authorized.

5. COMMAND AND SIGNAL

a. Annex G (Signal) to OPORD 36.

b. Report location, type, completion time, and execution of demolitions in prescribed number of copies on standard report or record forms. Acknowledge.

EDGAR
MG

Distribution: A
535th Engr Bn (Cbt)

OFFICIAL:
/s/ Carter
CARTER
G3

(Classification)

GLOSSARY

Terms that are defined in JCS Pub 1, Dictionary of United States Military Terms for Joint Usage, and AR 320–5, Dictionary of United States Army Terms, are not included herein.

Barrier study—A study of the terrain in a specific area, based on the broad operational concept for the area, and designed to develop recommendations for the optimum use and maximum effect of natural and artificial obstacles, as well as construction effort within the area.

Border denial—Any measure taken to prevent or hinder the infiltration of personnel, supplies, and equipment into the host country.

Covering barrier—A barrier located beyond the forward edge of the battle area which is selected by field army, corps, or division to assist in delaying actions of covering forces, and security forces.

Denial target—A specific area object or facility that because of its strategic value must be destroyed, damaged, contaminated, or otherwise rendered unsuitable for military use by the enemy.

Flank barrier—A barrier located to protect the flank of a division or larger unit and to prevent or slow enemy penetrations and envelopments.

Forward barrier—A barrier located generally along the initial and successive defense areas of the forward divisions. It consists of defense areas and strongpoints in depth, coordinated fires of all weapons, and natural and artificial obstacles employed in depth for close-in protection and defense in depth.

Gap—A portion of a barrier in which no obstacles have been constructed. It is wide enough to enable a friendly force to pass through in tactical formation; it is in excess of 16 meters and seldom less than 100 meters.

Intercept element—A land, air, or sea force using a variety of weapons to destroy detected infiltrators.

Intermediate barrier—A barrier located between the forward and rear barriers or between units of less than division size. It is designed to assist in limiting enemy penetration of the defense area, to canalize enemy forces into selected target areas, and to impede the lateral movement of enemy forces in the defense area.

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By Order of the Secretary of the Army:

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